# THE FAR EASTERN REVIEW

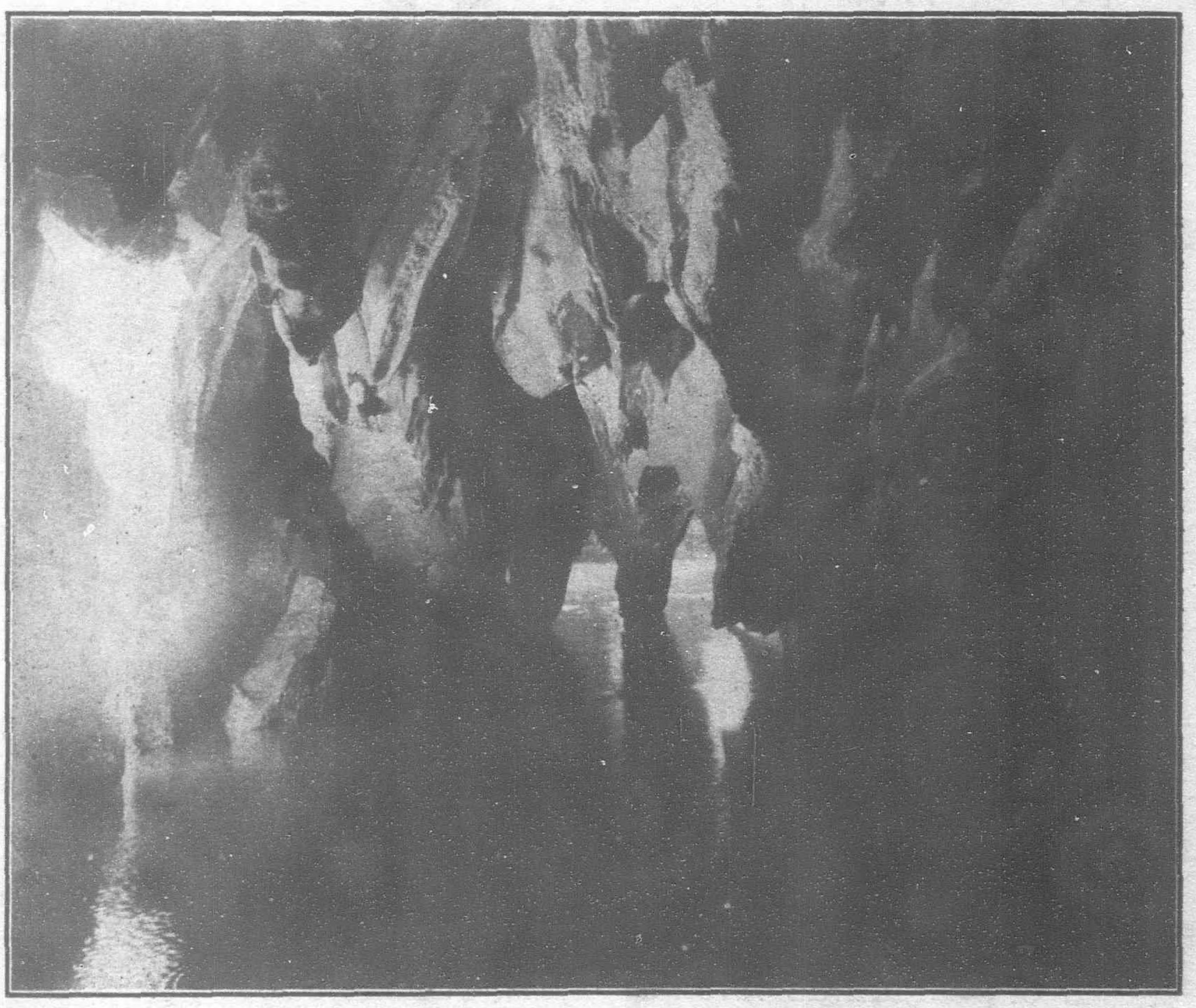
VOL. VIII.—No. 7. MANILA AND SHANGHAI, DECEMBER, 1911. 25 cents, U. S. Cy.

## The Kuangtung Section of the Canton-Hankow Railway

## The Chungking Electricity Works

## The Honolulu Iron Works in the Far East

## Mineral Resources of the Philippines



Subterranean River in Palawan, Philippine Islands.—Striking View from Interior.—Outward, Near Its Mouth, Showing Exit to Cove.

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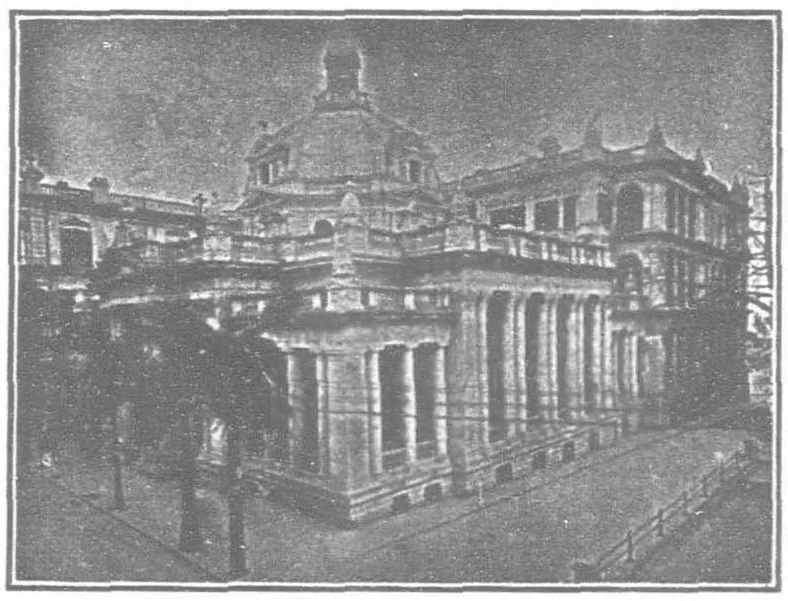

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THE FAR EASTERN REVIEW
COMMERCE • ENGINEERING • FINANCE

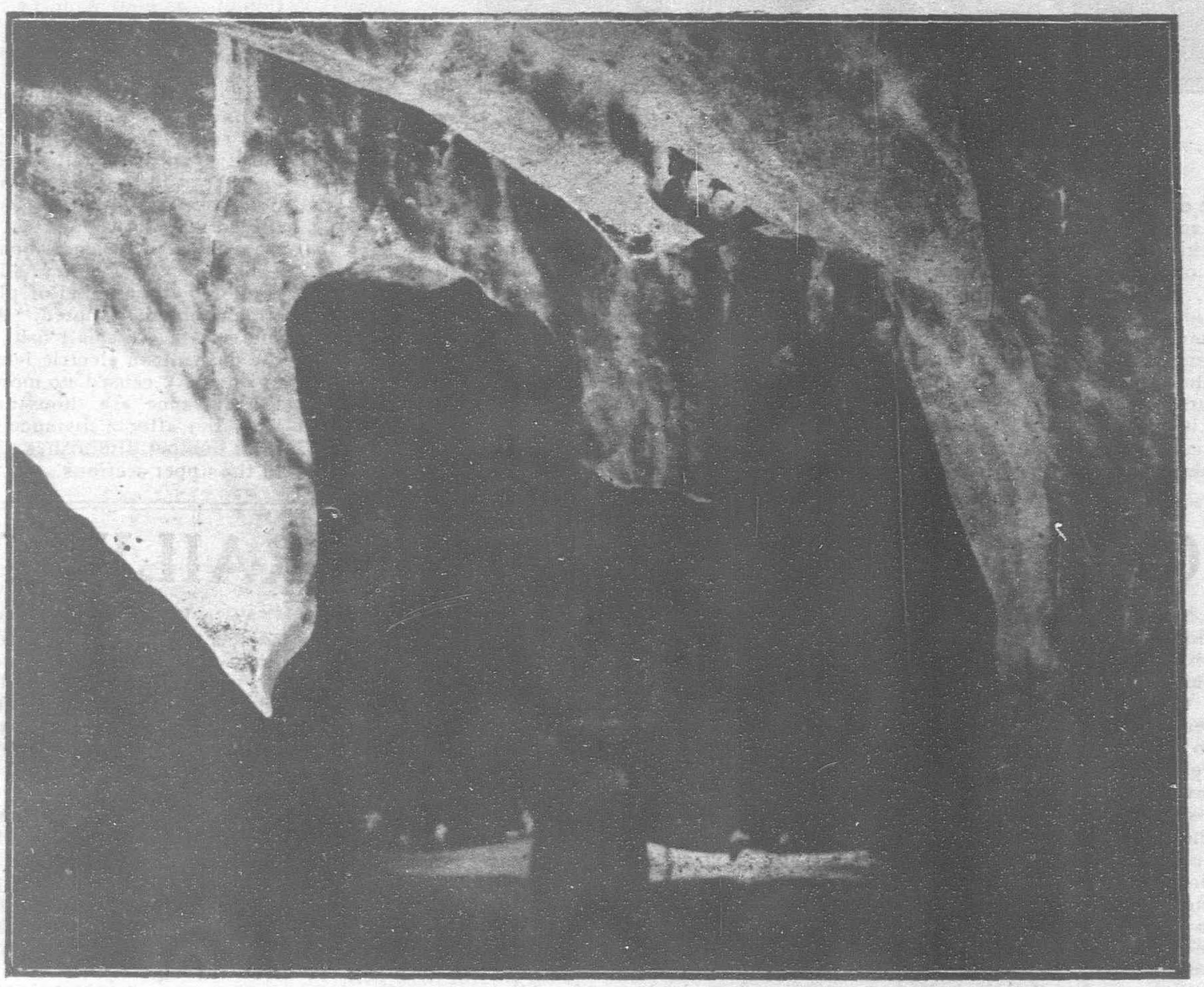
VOL. VIII. MANILA, P. I., SHANGHAI, AND YOKOHAMA, DECEMBER, 1911 No. 7.

# THE SUBTERRANEAN RIVER OF PALAWAN

We are indebted to the office of the Honorable the Secretary of Commerce and Police for the following notes regarding the subterranean river which has its source somewhere in the interior of the Island of Palawan and empties into St. Paul Bay, on the west coast of that island. Most of this information is taken from a report on the survey operations executed under the direction of Secretary Elliott by Mr. E. R. Frisbie chief computer in the Bureau of Coast and Geodetic Survey.

It is necessary that parties desiring to visit this interesting place should avoid making the trip in rough or unsettled weather, as, wheil portions of St. Paul Bay afford some measure of protection from southwest or northeast winds to a vessel at anchor, the entire shore line is exposed to surf during both monsoons, making landing in small boats difficult.

The cove into which the subterranean river empties is near the center of St. Paul Bay, and about three miles northeast of a small barrio situated in the extreme southern part of the bay. The entrance to this cove on the southern side is strikingly marked by a point sloping down to an elevation of about 25 meters, and abruptly terminating in a massive flat topped tower of rock, with vertical sides, closely resembling a fortified castle tower when seen from the northeast or southwest, close in shore. The north side of the cove is a steep wooded slope, showing occasional glimpses of bare cliff. At the head of the cove are 200 or 300 meters of sandy beach, across the north end of which the river flows. Off the mouth of the river is a bar with a depth of from 2 to 4 feet, depending on the tide. After crossing the bar, deeper water is found in the short channel where the river crosses the beach, and immediately behind the beach is a lagoon about 120 meters long by 25 to 30 meters wide, and with depths of 6 to 8 feet. The river empties into the upper end of this lagoon through an irregular arched opening at the base of a vertical cliff. The arch is some 6 or 7 meters in height, and roughly three times this in width.



THE SUBTERRANEAN RIVER OF PALAWAN.—FLASHLIGHT TAKEN SHOWING CHARACTER OF CAVERN

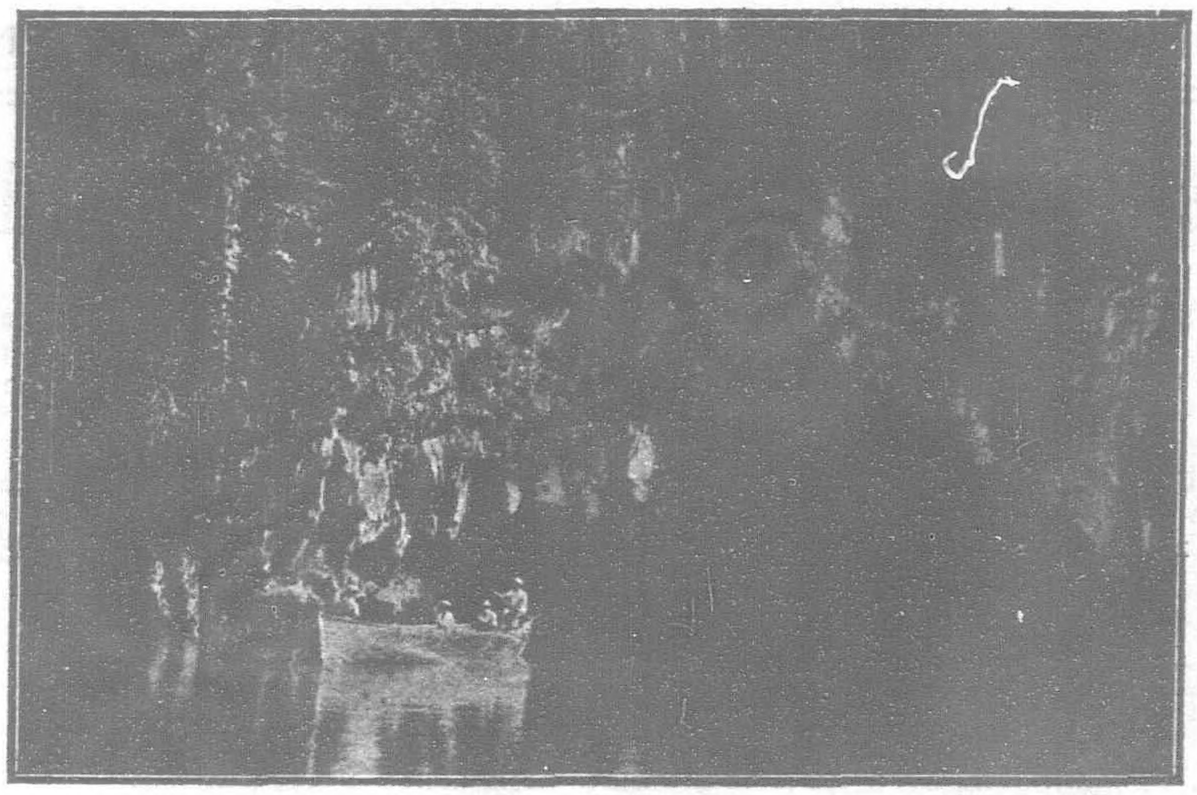
Just inside the entrance the channel is broken by columns and longitudinal knife edges hanging from the roof, which divide it into numerous small openings just capable of passing a boat. Fifty meters upstream these obstructions disappear, leaving a single clear channel. but for the first 400 or 500 meters there are numerous small side openings or pockets. At a distance of 200 meters daylight is seen through one of these crevices, and at 500 meters the channel opens into the first prominent cham-

ber, containing columns, stalactites, and one very prominent stalagmite.

The next 1000 meters is characterized by a long straight channel, with an easy curve near its center. This channel, although rich in local detail, is strikingly regular in the main outlines, which consist of straight vertical banks curving upward into inclined roof sides which meet in a central ridge modified at its apex by small parallel hanging blades. Throughout this channel are numerous beautiful forms of stalactites, resembling chandeliers, bulbs, plates and hanging points and blades, but no stalagmites, as the entire width of the cavern is occupied by the river.

At 1500 meters this tunnel section continues in an elevated prolongation extending upward beyond the river, which at this point flows through an arch about 2 meters high on the west side of the channel. On the east side of the channel, opposite this arch, and just inside the beginning of the elevated cavern, a small waterfall, which attracts attention through its volume of sound, is hidden in a narrow crevice. After passing under the arch the section becomes more broken, consisting of irregular chambers for about 200 meters, when another low arch is encountered, beyond which the chambers become larger.

Continuing upstream for the next 1000 meters, or to a point about 2700 meters from the entrance, a large chamber is found, where the stream abruptly turns, first to the right, and then to the left, around a prominent sharp shoulder reaching to the lofty roof. On the right is a large elevated cavern with two prominent pillars near the bank of the stream. This 1000 meters is characterized by the increasing size of the chambers, and by mud banks piled in shelves in side pockets. These banks are rare in the lower portions of the river, but after reaching this point they become increasingly apparent, both where they are piled in the recesses by flood water, and at short stretches, first on one bank, and then on the other.



COVE SHOWING ENTRANCE TO SUBTERRANEAN RIVER

Proceeding upstream from the prominent chamber above mentioned, the section contracts to one similar to the straight channel as described between the 500 and 1500 meter points, but on a somewhat larger scale. This continues for about 300 meters, or to about 3000 meters from the entrance, where, after a slight reverse curve, the cavern opens into a series of chambers considerably larger than any previously encountered. This succession of chambers continues for about 1000 meters, or to the 4000 meter point, where the survey terminated. In this last section the side walls frequently recede from the stream, which is left to meander between mud banks on either side, while the roof rises in places to heights estimated at over 30 meters. The depth of the stream diminishes, so that it is frequently necessary to maneuver the boats to avoid grounding on shoals.

At about 4000 meters the stream is entirely blocked in a small pool, from which a noticeable current flows downstream, but into which no current could be found entering. The pool is bounded on the right by a solid rock wall, but its left side consists of a pile of boulders and loose debris perhaps 12 meters in height, and lying just beyond an immense column supporting two roof arches. So far as is known, progress in boats is impossible beyond this point, and the party making this investigation had not enough time at its disposal to attempt to continue the survey on foot. An ascent was, however, made to the top of the rock heap which, barred further progress, and it could be seen by means of an electric hand lamp that there was a continuation of the cave in the distance beyond Whether this opening contained water was not ascertained. The last point reached lies about 1000 meters N. N. W. from the peak of St. Paul Mountain, which is given an elevation of 1027 meters on the charts.

The stream in general fills the entire cavern between usually straight walls, and there are no navigable side openings of any importance, so that there is no difficulty in following the channel. The water is fresh, and at the time of this survey was flowing in a gentle current hardly exceeding half a mile an hour. There are marks on the side walls indicating that the flood level may be 4 or 5 feet higher than when the survey was made. At places water drips from the roof in small quantities, but in general the cavern is dry. The air is pure and cool, and at a number of places a gentle downstream breeze is noted. At the upper end of the stream are small fish, doubtless blind, as the flash of an electric lamp within a distance of one foot caused no movement. Just inside the entrance are thousands of swallows and bats, but after a distance of 300 or 400 meters their number diminishes. They are quite rare in the upper sections.

# SIGNALLING ON CHINESE RAILWAYS

Travellers are accustomed to look for certain necessary precaution and safeguards to insure that the trains on which we are travelling will arrive without accidents at the end of the journey. To those who have only travelled in countries which compel the Railway companies to ensure the safe working of their line, travelling in China would cause some surprise, owing to conditions under which some trains are run.

The Signal is the passenger's principal safeguard, and its prime duty is to prevent two trains, in motion, being on the same section of the line at the same time. It is much the same, so far as the passenger is concerned, whether he is the victim of a head on or a rear end collision.

Signals should be arranged so that it is impossible for any two or more trains to meet when in motion, or to overtake one another.

Engineers have different ideas as to how this can best be accomplished. The following particulars of one of the most approved practices for protecting the running road, might be adopted by the various railways in China with profit.

The system possesses the excellent quality of being simple and easily understood and could be efficiently worked by Chinese railway officials, without complicated machinery or extravagant use of materials, and is at the same time absolutely "fool-proof".

The duties of the different signals and the system on which they are worked should be explained: Suppose a train travelling in either direction on the running road, it will first of all come to the Distant Signal, which is distinguished by being fishtailed. This is controlled by the Home Signal, and so interlocked, that it cannot be lowered until the latter is lowered. It therefore shows the engine driver in advance the position of the Home Signal.

The Home Signals are fixed immediately outside the station, protecting all that lies within, such as points and their connections, etc.

*Detectors.*—These indicate that the Points are butt up to the Stock rail, further, guarantee that the points lie for the right direction, and until such conditions are fulfilled, no signal can be lowered. All detectors have a double rod with connections for each rod, and are placed so as to avoid trouble caused through expansion and contraction of the rails, as closely as possible to the switches they are to detect.

Economical facing point lock, and bar, can be fitted to prevent the points being moved during the passage of a train over them, and are operated by an ordinary point lever or a throw over lever.

A patent lock can also be provided for the siding points and so arranged that the key can be kept in the lock on the locking Frame, so that the siding points can be worked when the signals are at danger.

As to how the various signals between the adjacent stations are made to work in with each other can best be understood by describing the instruments used and the methods adopted to pass a train safely from one station to another by the Tyer system.

*Tyer's Automatic Tablet Instrument.*—Fig. 1 illustrates the working of the visual type which is as follows:—

It consists of a galvanometer indicating the passage of "line passage," two plungers "Bell" and "Switch" and upper slide (for restoring tablets to the instruments), an indicator (showing 3 positions, "Line closed," "Up train approaching" and "Down train on line" or with other suitable lettering), a glass shutter at the foot through which can be seen the Tablet resting one above the other (thus affording an indication of the number available), and a main slide through which the Tablets are issued.

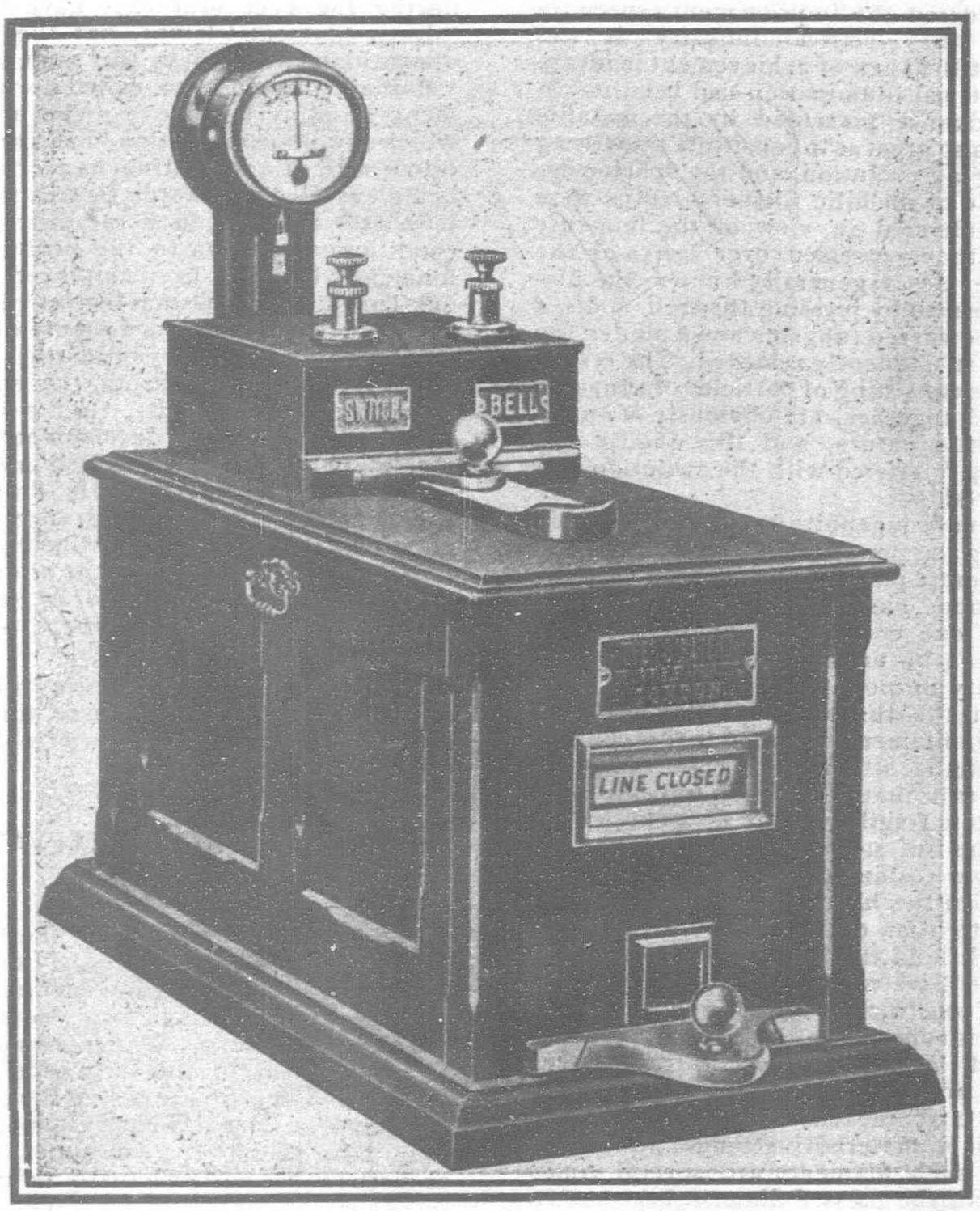
*Outline of Working.*—Take two stations, "A" and "B," and imagine "A" has a train ready to go to "B". After giving the usual code, "A" holds down his Bell plunger.

"B" depresses his switch plunger with his left hand, and at the same time withdraws his slide with his right hand: the withdrawal of this slide (which can only be half way) will reverse the commutator in the instrument, and will bring the signal "Up train approaching" in view. "B" will then depress his bell plunger, holding down on same for a few seconds. "A,"

upon receipt of this signal, will hold his switch plunger with his left hand, and with his right hand draw out his slide to its full extent, and will bring in view the signal "Up train on Line."

"A" will remove the Tablet from the recess in the slide and will hand the same to the Engine driver. "A" then gives the departure signal.

As soon as the Train arrives at "B" the man




TYER'S PATENT TRAIN TABLET APPARATUS

there withdraws the slide and inserts the Tablet, pushes the slide home. The passage of the Tablet into the cylinder unlocks his instrument and "B" then pushes in the slide which restores his Visual signal to "Line closed". He will then give "A" the "Arrival signal" holding down on the last beat.

"A," on the receipt of the "arrival signal," will depress his switch plunger, and push home his slide, which will at the same time restore his Visual signal to "Line closed".

For a Tablet that has been taken out for shunting, or for the purpose of entering some intermediate siding, and which is returned to the station from whence it was issued, the manipulation of the machine is practically the same. The man who issued the Tablet merely returns the same into his machine by means of the slide, which will restore the apparatus after the passing of the usual signals.

The stations at each of the sections have at all times an absolute record of what has been done on both instruments, which record can not be disturbed until the Tablet has been placed in the apparatus at either end or he other.

The screens with the visual signal indications are lettered in pairs, and the screen at "A" would be lettered "Up train on Line" on red ground, the screen at "B" "Down train on Line". The normal condition of both instruments at "A" and "B" is "Line closed".

The following are some of the advantages of the above apparatus:

Instruments are very strong, the case being of iron. All spindles and bearing are of German silver to prevent rust: and the commutator is so arranged that it is impossible for a failure to take place. The springs being fixtures, and the commutating plates fixed upon a slab of ebonite which is firmly screwed down to the Main Slide, a most perfect rubbing contact is obtained and both plates and springs are continually kept cleaned by the manipulation of the machine. This is a most distinct advantage, especially for foreign work.

Following are a few of the desirable features considering only one Line wire is required: Small amount of battery power, one battery being required for each instrument. No permanent current, battery only used during code, etc; Everything being locked up, so there is no possibility of tampering. The manipulation is very simple. The internal parts being few, the maintenance and supervision is therefore reduced to a minimum.

There are three unalterable signals, viz:

*Line closed*; *up train approaching or on line; down train on line.*

Outdoor signals, points, swing bridges, etc., can be electrically controlled, in connection with these machines at any time should the necessity arise, at only a small additional cost to the apparatus, and without the removal of the instruments for the parts to be fixed.

Intermediate sidings can also be controlled by a Patent Tablet Point Lock, no alteration being required to the Tablet. Trains running at high speed can exchange Tablets by means of a simple apparatus fixed on the side of the Line and on the Engine.

Tyer's Tablet Instruments are world famous, and used on the majority of Single Lines in Great Britain, in the Colonies and other countries. There are various types, but the main idea is the same throughout, particulars of which can be had from their Agents.

The Far Eastern representative for this firm (Mr. F. A. Punter, c/o Messrs. Samuel & Co., Limited, Shanghai) is prepared to furnish all particulars and quotations for every description of mechanical and electrical appliances for economical Railway Signalling suitable for Chinese Railways.

## THE HISTORY OF THE McCALL INCINERATOR

In 1898 the United States Army was increased from 25,000 men to over 200,000 on account of the declaration of war with Spain. Large camps of mobilization were formed at Camp Meade, Pennsylvania; Camp Alger, Virginia; Jacksonville and Tampa, Florida, and Chickamauga Park, Georgia. Over 100,000 men were stationed at the latter camp.

As a result of the large assembly of troops in one place, the question of sanitation was one of the vital points to be considered as the soldiers would disregard the rules of camp sanitation, and became an easy prey to such preventable diseases as typhoid fever, dysentery, etc. In May 1898 Dr. McCall was appointed Acting Assistant Surgeon, United States Army, with station at the General Hospital, For McPherson, Atlanta, Ga It was at this place that the Incinerator idea was brought very vividly to mind on account of the large number of soldiers being brought in with typhoid fever.

In the camps mentioned the old camp sink of Civil War times was used—a pit in the earth eight feet deep, ten feet long: and three feet wide. Flies would swarm to the sinks, walk over the excreta, then go to the kitchens and dining rooms, walk over the food, leaving in their tracks the germs of typhoid fever. Naturally an epidemic of typhoid fever was the result.

In rainy weather the sinks would frequently overflow, the contents being distributed over the camps, resulting in the most unsanitary conditions imaginable.

In many sections of the country it is practically impossible to dig sinks of any depth without considerable expense on account of stone formations and in some places at a depth of two feet frequently water is struck.

The water supply in the neighborhood of these camps was contaminated and this was another source of infection.

This unsanitary condition prevailed in all army camps in the United States and Cuba and later in the Philippine Islands. After some years' experience in camp in the United States and Philippine Islands as surgeon, Dr. McCall concluded that the only way to satisfactorily dispose of excreta, and thereby prevent typhoid fever, dysentery, cholera, etc., was incineration. With this idea in view, his first experiments were made at the Columbia Arsenal, Tennessee, in 1904 where he was stationed with his troops.

After numerous experiments at that post, the results were reported to the Surgeon General of the U. S. Army. As the problem of disposal of escreta in camp was considered a most serious one and still unsolved, the Surgeon General and other officials at Washington looked upon his experiments with favor and rendered all aid possible toward the development of the idea.

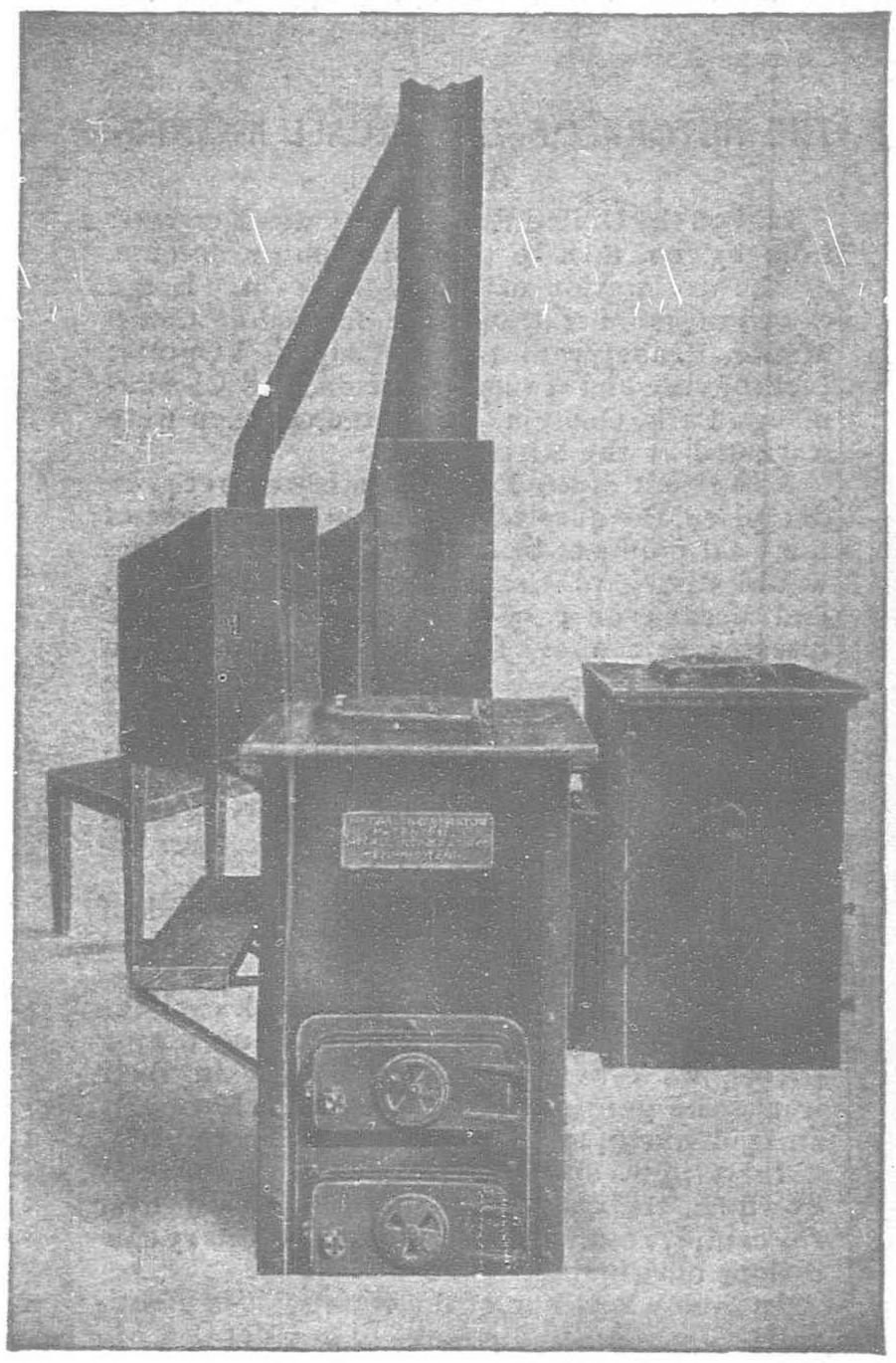
The next year May 1905 the incinerator was installed in the Maneuver Camp, Chickamauga Park, Ga. A board of Army Officials was appointed to inspect and observe the operation of the incinerators during the encampment. A sanitary expert from the Surgeon General's office, Washington, D. C., was also present to observe the tests.

A favourable report was made, and the board recommended the adoption of the McCall Incinerator for use by all troops in camp. This report was approved by the commanding General, *resulting in official adoption by the War Department.*

In 1907 at the Jamestown Exposition Camp, twenty five McCall Incinerators were installed for the use of the United States.

Excellent reports were made as to their merit and operation.

The banner year for army maneuver camps was 1908. At Pine Camp, New York, 15,000 troops were stationed, using 105 McCall Incinerators. About 9000 were stationed at Chickamauga Park, using 72 McCall Incinerators. At these encampments all excreta was incinerated, and not a single case of typhoid fever developed in either camp.



THE MCCALL INCINERATOR

A small model of the incinerator was recently purchased by the War Department, and is now on exhibition at the Army Medical Museum, Washington, D. C. This model is also used by the Medical School for the instruction of the medical officers of the Regular Army and Organized Militia.

The excellent results obtained by the army from the use of McCall Incinerators caused the United States Marine Corps to adopt the machine for use in their camps at Guantanamo, Cuba, and Honolulu, H. T.

Col. William C. Gorgas, Medical Corps, United States Army, deserves the unstinted gratitude of the entire world for his work in Cuba, where, by cleaning up Havana and other cities and destroying breeding places of the Stegomyia Fasciata (yellow fever mosquito), he has driven yellow fever from the island and converted Havana into one of the cleanest and most attractive cities in the world.

Colonel Gorgas is now Chief Sanitary Officer of the Panama Canal Zone, and, upon recommendation, McCall Incinerators have been in use in Panama for the past three years.

Following the lead of the Government in the improvement of army sanitation, the general public is appreciating the improved conditions and is taking hold of the situation in earnest.

Not only in the United States but in all foreign countries, the McCall Incinerators are being considered a necessity in all contractors' camps, railroad shops, factories, establishments of various kinds, in cities out of reach of sewerage systems, small towns, schools, churches, jails, asylums, summer resorts, hospitals, fair grounds, parks, etc.

The device is a Steel Fire Box lined with asbestos, to prevent expansion and is made in the following sizes: eight, four, two, and one seat. The eight seat will accommodate 150 people and consumes one cord of wood per month for fuel, it will not be necessary to always burn wood as coal refuse, etc., can be used.

At the coming Philippine Carnival to be held in Manila, P. I., from Feb. 2nd to 12th, inclusive, several Incinerators will be on exhibition and a large stock is expected shortly.

Frank L. Strong, Consulting Engineer, contractor and importer of American machinery and supplies, Manila, is the exclusive agent for the Far East.

## A NEW ELECTRIC LAMP

FILAMENT OF DRAWN TUNGSTEN WIRE.

When the metallic filament lamp made its appearance, just at that period when the aggressive competition set up by scientific gas-lighting rendered the improvement especially valuable to the electrical industry, it was thought that the apex of achievement in incandescent electrical illumination had been reached. The advance presented by the metallic filament was so great as to constitute something approaching a revolution, and the deficiencies characteristic of metallic filament lamps were cheerfully tolerated in view of the immense advantages they possessed over lamps of the carbon type. As is generally known, the filaments are formed by pressing through a die a mixture of powdered tungsten and a binder, the latter being subsequently removed. The resulting filaments consisting of particles of tungsten locally fused together, are obviously of an extremely brittle nature, and this quality has consequently interfered with the evolution of a really ideal lamp.

Extraordinary ingenuity has been expended in improving the pressed tungsten filament and various elaborate processes have been employed, but in none has it been found to obtain a filament in one continuous length with the desired strength, uniformity in cross-section and flexibility in mounting. It was only practicable with the threads of pressed metal to form the thin filaments required in this country of short lengths attached to rigid supports, with the result that it has been impossible to avoid a certain fragility in the filament. Consequently the tungsten filament lamp has not been able to withstand ordinarily rough usage.

These difficulties have for some time past engaged the attention of the General Electric Co. of New York, and the British Thomson Houston Co. who have now evolved and developed a method of constructing the filaments of drawn wire which is superior to the ordinary pressed or "squirted" filament in exactly those essentials which are necessary to the most perfect type of electric incandescent lamp. In the first place it is materially stronger and lamps made with such filaments are several times stronger than the pressed filament type at any point in their life.

The risk of breakage is substantially reduced by the elimination of the rigid connections which have hitherto been a feature of tungsten filament lamps. Instead of short lengths, welded to the supports at four or five different points, the filament is formed in one continuous length, wound upon spider supports with clamped flexible connections to the leading-in wires. The drawn filament is, besides, continuous, and is not subject to the variations noticeable in the ordinary metal filament lamps, where, as is often the case, one section of the filament will burn at higher temperature than the rest, thus reducing the life of the lamp. The enormous advance represented by the production of a drawn wire tungsten filament of accurate uniformity and continuous length is obvious. The advantages of this new development will be immediately available for the public in the "Mazda" lamps, which are manufactured at the British Thomson Houston Co.'s Works, and the various lamp factories of the General Electric Co. of New York.

Tungsten owes its efficiency as a material for incandescent lamp filaments chiefly to its high melting point—3,000 deg. C., which is higher than that of any other metal. Roscoe & Schorlemmer, in the latest edition of their "Treatise on Chemistry," state that "the purest forms of tungsten at present obtainable are hard and brittle and are not ductile, either at ordinary temperatures or when heated. "Even in ordinary commercial lamps, the filaments are of a degree of purity so high that no impurities can be discovered by the most searching methods of chemical analysis known. Nevertheless, these filaments show no traces whatever of ductility, or even pliability, but on the contrary, though strong enough for mounting in commercial lamps, they are exceedingly brittle and incapable of taking a permanent set. Ductile tungsten is a bright, tough, steel-coloured metal, which can be drawn into the finest wire much below one thousandth of an inch. The tensile strength of the wire increases as the drawing proceeds; or, in other words, the more the metal is mechanically worked, the tougher and stronger it gets.

There have been various lamps on the market during the past year that have been called "drawn filament" lamps, but they are not a drawn filament lamp in the same sense as the "Mazda". In these so called drawn wire filaments an alloy is made of nickel and tungsten which gives a combination that can be drawn into a wire of one continuous piece, the nickel being expelled afterwards by treatment, which leaves the filament in a more or less porous condition analogous to the ordinary pressed filament which has been employed in the various Tungsten and Osram lamps. This process therefore does not produce a pure ductile tungsten wire, but is an alloy or mixture, just as the pressed filament is during the squirting or drawing of the filament. On the other hand, the Mazda drawn wire development starts with absolutely pure tungsten which is worked into a billet and rod and gradually drawn into the necessary size of wire through successive manipulations, the whole material being pure tungsten from start to finish with no alloy or foreign ingredient which requires to be expelled at a later period by special treatment to the detriment of the filament strength.

This new filament of pure drawn tungsten on account of its ductility is several times stronger than drawn alloy of tungsten or older forms of squirting tungsten.

## THE BROWN PORTABLE ELEVATORS AND CONVEYORS

The goods manufactured by the Brown Portable Elevator Company consist of labor-saving machinery designed for the economic piling and handling of materials in bags, bales, boxes or bundles of any kind. The expense of handling of commodities in this form adds very considerably to the ultimate cost of the goods to the consumer, and as this expense must always be eventually paid by the consumer, any device or method that will effectually reduce it by the saving of either time or labor tend to his benefit. It also enables the producer to meet competition in the most distant markets.

The ordinary method of piling goods in packages is by building up separate tiers or layers with two or more men standing on each layer to raise the material. Thus for a pile five tiers high, ten men are required, but with the portable elevator made by the Brown Portable Elevator Co., all the work of lifting is done by the machine, the only labor required being that of placing the package on the machine at the bottom of the elevator and placing it on the pile at the top.

The use of these machines presents many opportunities for economy and efficiency in the handling of materials in warehouses, stores, shops, railway freight houses, steamship piers, etc., and they have been adapted for loading and unloading cars, barges and wagons, for transferring goods from boats to cars and trucks, and for many other purposes which involve the non producing expense of moving goods by hand.

The Company has manufactured these portable elevators and conveyors in Portland, Ore., for the past nine years, and in Saginaw, Mich., for one year, but the constantly growing demand from all parts of the world has rendered the present factory facilities inadequate, and made necessary the building of the new factory in made North Chicago, where they will have all modern facilities for meeting this demand, and for building machines to meet any special requirements. The company expects to commence the operating of its new factory in January, 1912, with a capacity of one machine a day. This will replace the present Saginaw factory, but the Portland plant will be continued and arrangements have also been made for the building of machines in Canada.

# THE CHUNGKING ELECTRICITY WORKS

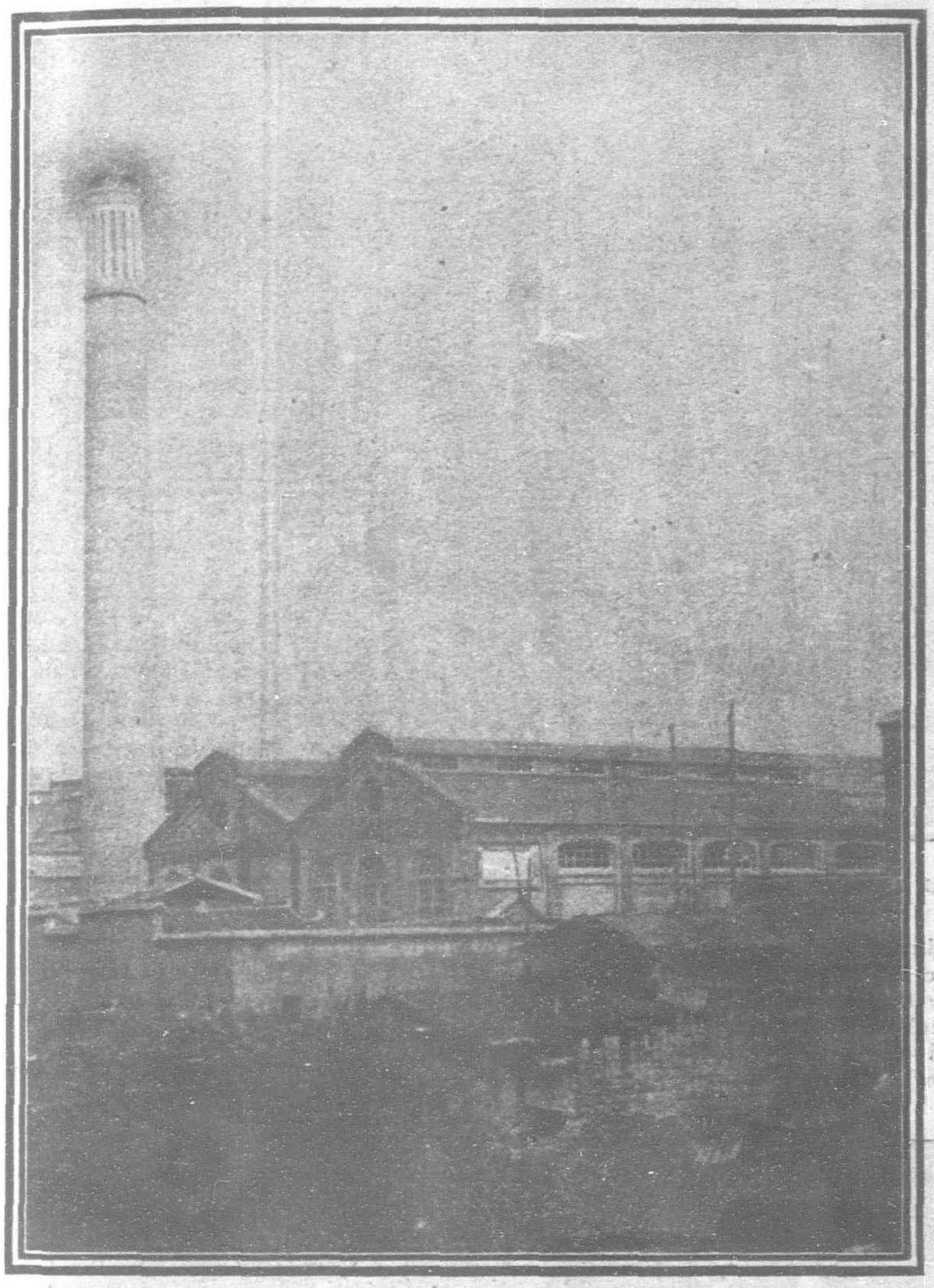
A year has passed since the Chungking Electric Light Company first supplied current to their consumers and a description of this company's plant may be of interest.

Chungking, the commercial capital of West China and a city of 650,000 inhabitants, is situated on a promontory formed by the junction of the Kia Ling or Little river and the Yangtze about 1500 miles from the mouth of the latter. The city is one of the most crowded in China, measuring only 5 li long by 3 li broad; the streets are narrow, crooked and uneven; and, being built on both sides of the rocky hilly peninsula, Chungking is a city of steps.

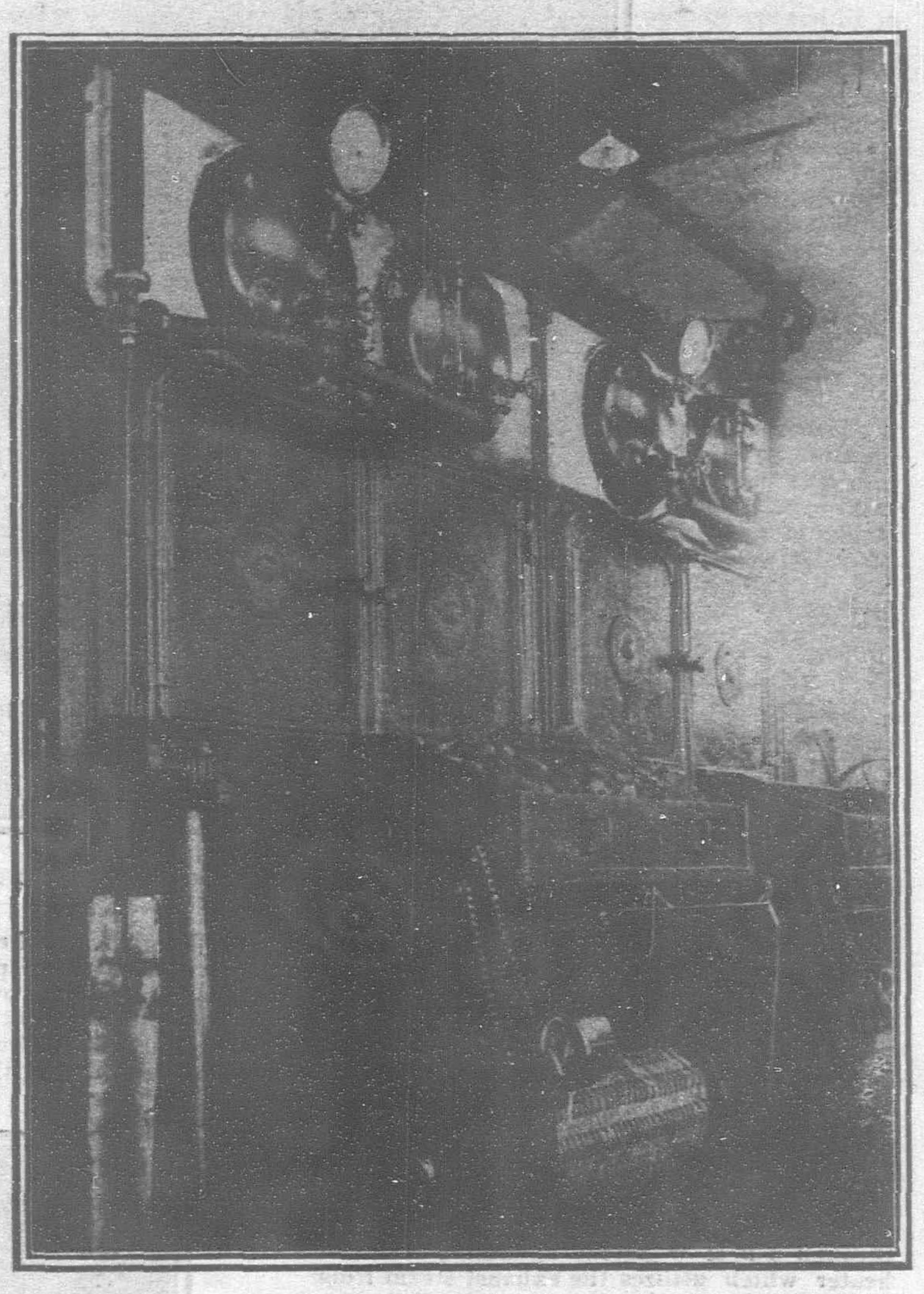
A successful experience with a small 10 KW, 110 volt, direct current installation, induced the Directors of the Electric Light Company to embark on a bigger venture and accordingly in May 1909 Mr. Liu Pieh Kah, the manager, proceeded to Shanghai to purchase the necessary machinery, and after some weeks of negotiation the contract for supply and erection of a 500 KW. direct current plant was secured by Messrs Arnhold, Karberg & Co., in the face of keen competition.

A brief description of the new plant is as follows:—

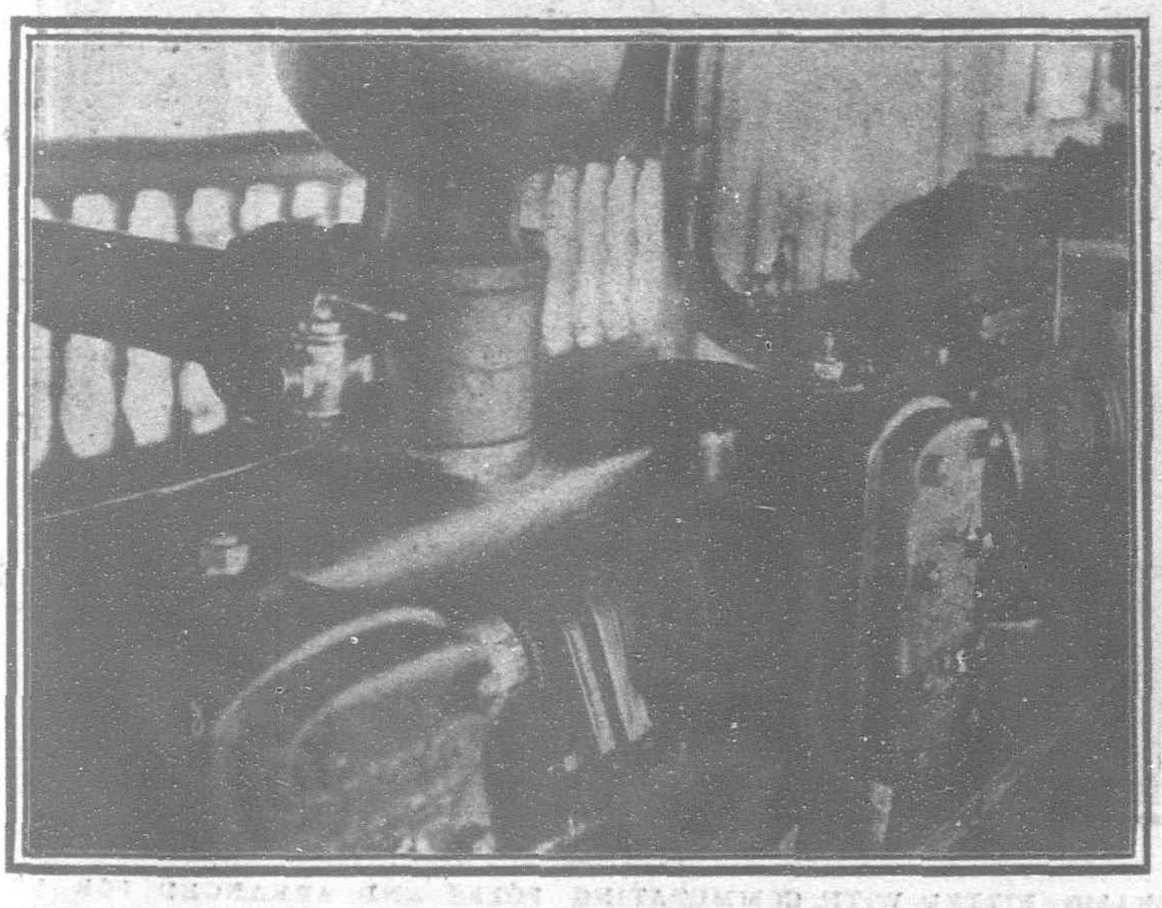
Steam is generated by two Babcock & Wilcox patent water tube boilers set in one battery. These boilers each have 2531 sq. feet of heating



GENERAL VIEW OF THE CHUNGKING ELECTRICITY WORKS



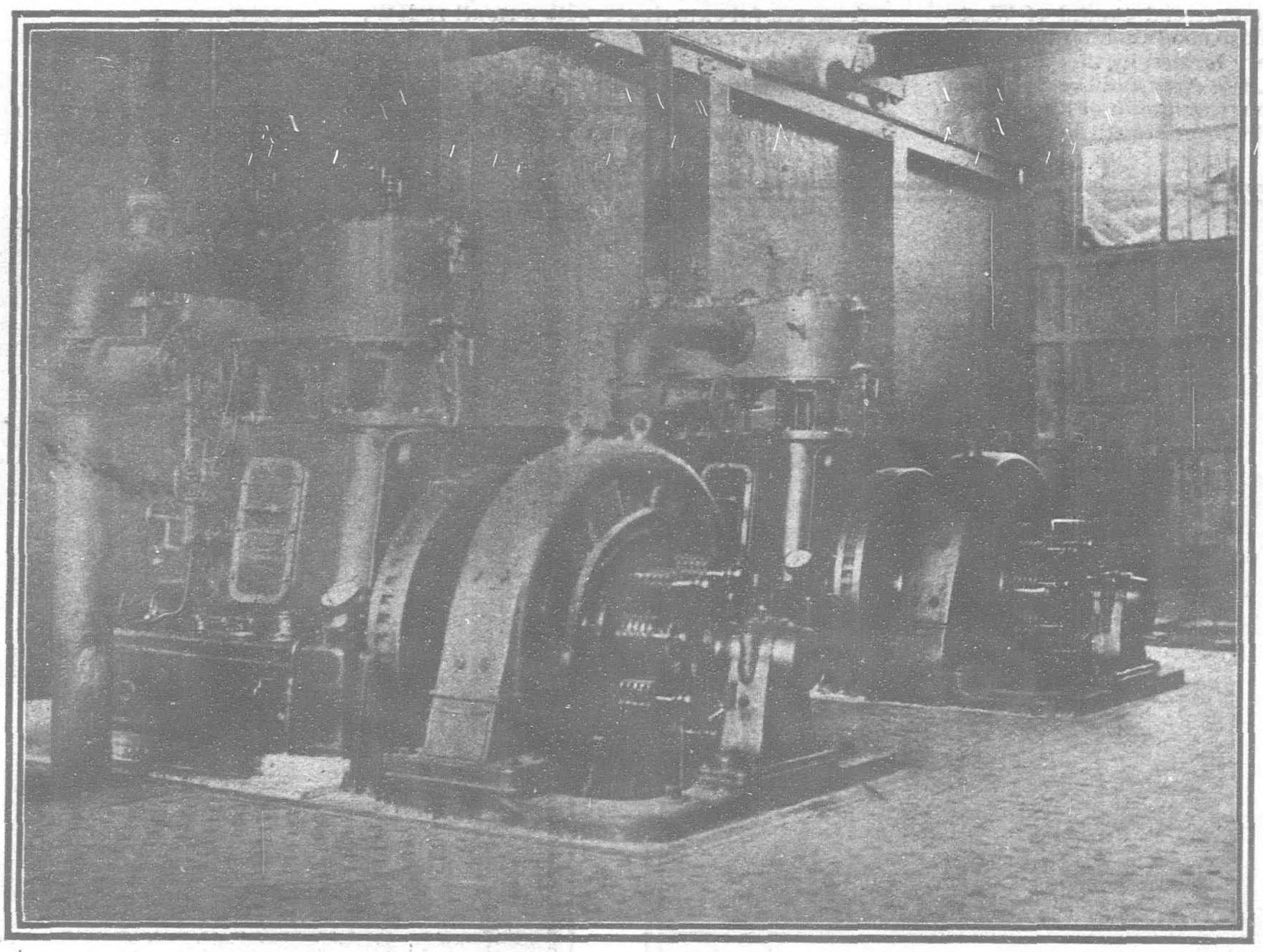
BABCOCK & WILCOX BOILERS WITH CHAIN GRATE STOKERS



THE "CAMERON" PUMP WHICH SUPPLIES WATER TO THE WORKS

THE AUXILIARY PLANT

surface and both are fitted with integral superheaters and chain grate stokers by the same makers. The superheaters have each a heating surface of 428 sq. ft. and are of sufficient capacity to allow of the steam produced by the boilers receiving a superheat of 160 degrees Fhr.



GENERATING UNITS AND ENGINE ROOM

The stokers are engine driven and each have a grate area of 51 sq. ft. The installation of superheaters is desirable in a plant such as this, running under noncondensing conditions, but it is questionable whether the automatic stokers justify the outlay as the native engineers look upon them only as an additional complication and frequently revert to hand firing.

Two duplex feed pumps by Alex. Young & Co. are provided, each large enough to supply both boilers at one time. Before entering the boiler the feed is ltered and then passes through a B & W patent exhaust feed water heater which utilizes the exhaust steam from both main engines.

Two generating units are provided. The engines are by Belliss and Morcom, being their standard, compound self lubricating type, and each engine is capable of developing 370 BHP when supplied with superheated steam at 160 lbs. per sq. inch and running at a speed of 375 RPM.

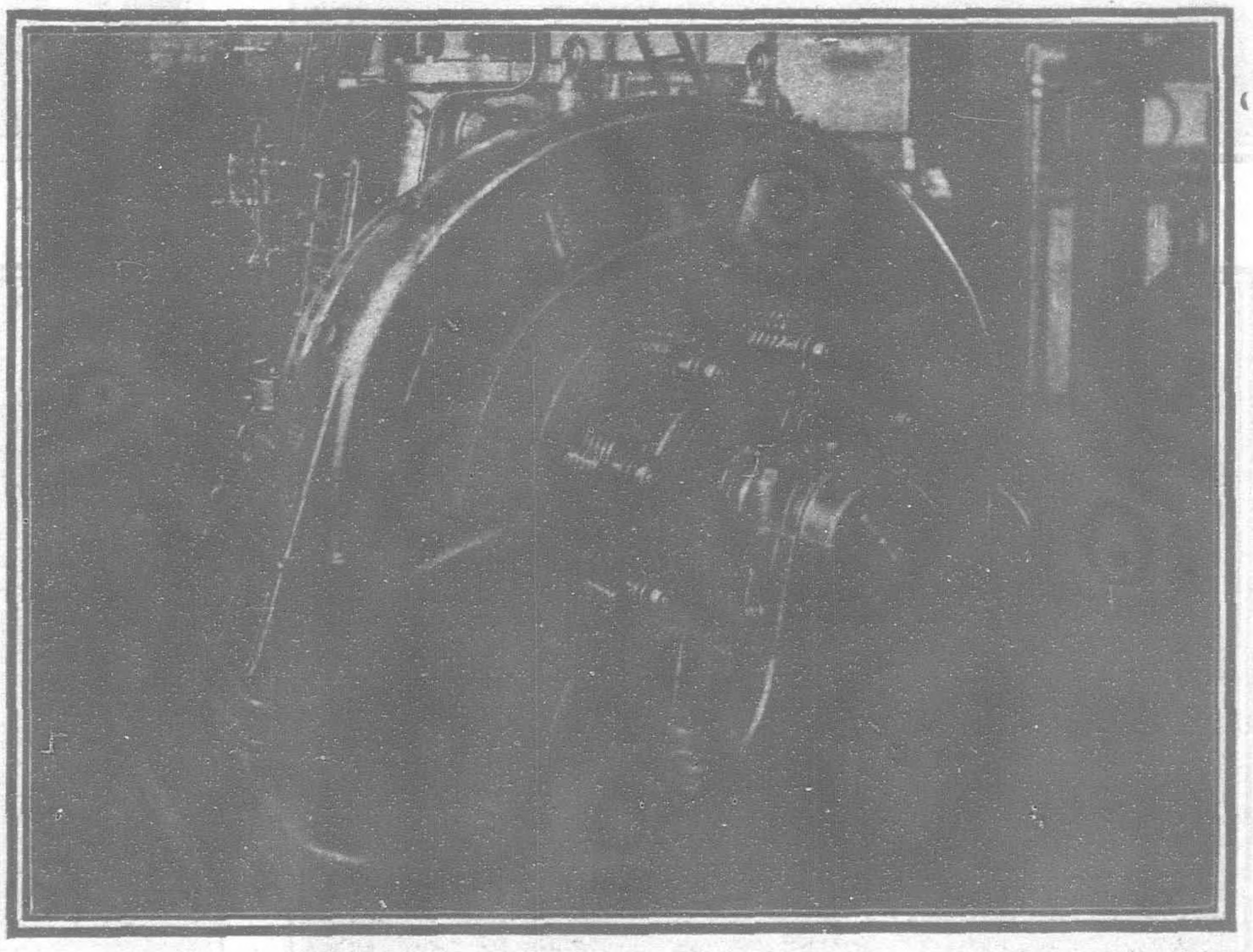
Direct coupled to the engines are the A. E. G. generato s, but mounted on separate sole plates. The dynamos are each 250 KW. direct current, 440/500 volts. 3 wire system. They are fitted with commutatiug poles and arranged with slip ring connexions to the armature for use with static balancers. The balancers, two in number, are capable of dealing with a 15% out-of-balance load. This type of balancer has proved quite a success.

A 4 Panel A. E. G standard type switchboard is provided on which are mounted the 2 main generator switches, 6 triple pole feeder switches and 2 double pole switches for station lighting. The dynamos are protected on either side by automatic circuit breakers, but these are mounted on special marble slabs fixed to the fuse rack behind the board. Pilot lights protrude through the main panels showing position of autos.

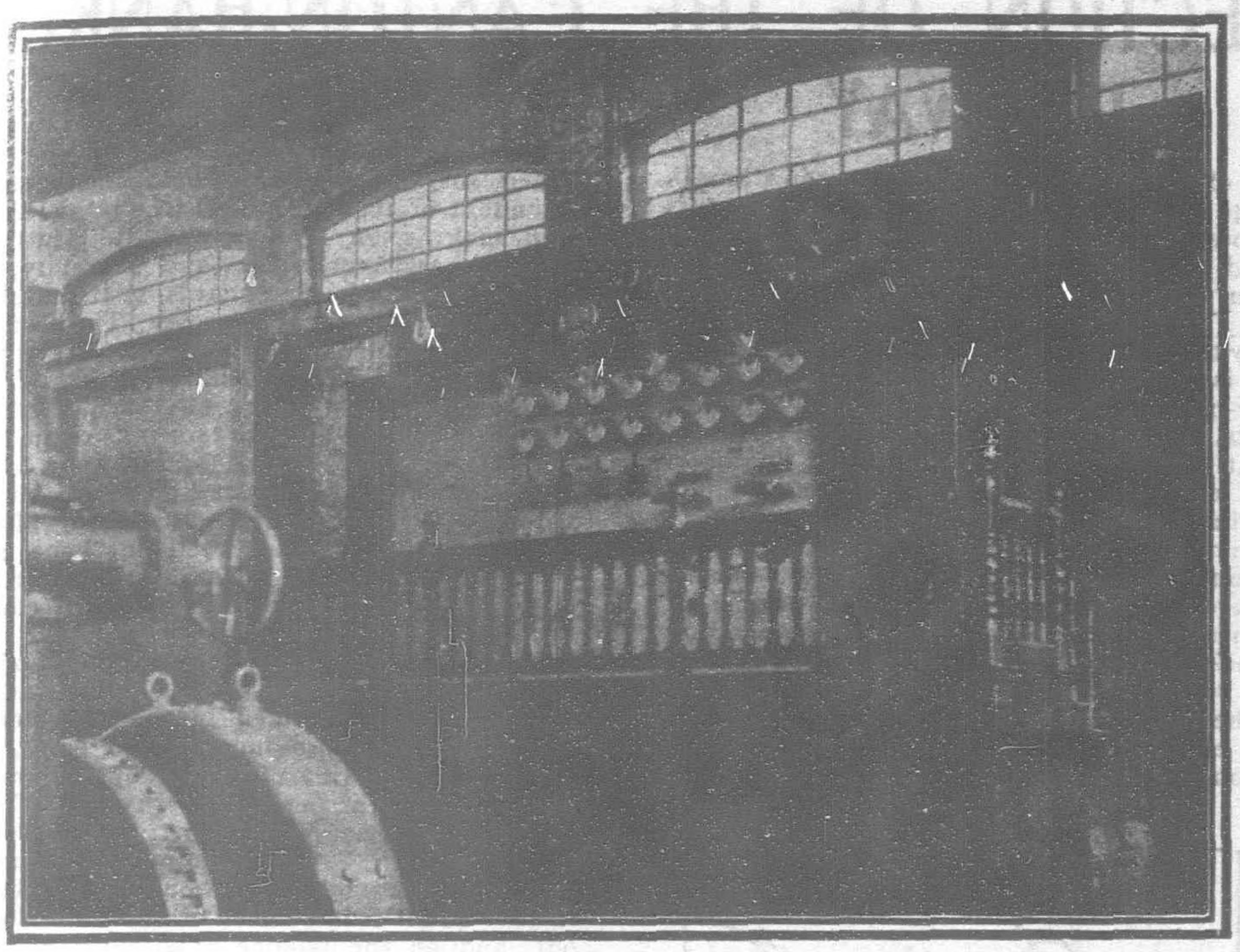
Current is distributed over the city on the 3 wire system, but invariably the feeders are too small and therefore the voltage drop towards the outskirts of the city is considerable. The overhead was supplied and erected by the natives themselves and the manner in which the street wiring is carried out leaves much to be desired.

The water supply system for the works had to be designed to rather unique conditions and in the ab ence of any public supply the company had to make their own arrangements regarding this most important branch of the undertaking. The Yangtze at Chungking is a swift running stream and during the low water season is comparatively free from suspended impurities, but during the summer it carries much mud and other matter. Further, between high and low water level, i. e. summer and winter level, the difference in level is from 60 to 100 feet and the width is from 400 to 1000 yards and has been known to exceed these limits, any fixed pumping station would therefore be impossible and the following arrangement was finally decided upon:

The main pumping station consists of a loco



250 K. W. A. E. G. DYNAMO, FITTED WITH COMMUTATING POLES AND ARRANGED FOR USE WITH STATIC BALANCERS



THE SWITCHBOARD

type boiler which supplies steam at 100 lbs. pressure to a "Cameron" pump which is large enough to deliver 400 gallons per minute against a head of 350 feet. This plant is mounted on a floating pontoon moored in the river just below the works. The delivery pipe line runs up the face of the cliff to the city street level and is provided at about every 20 feet of length with tee pieces to which can be connected the flexible hose couplings from the pontoon. In the station compound have been built the two water storage and settling basins; these are arranged side by side and each measures 52 × 20 × 15 feet deep and having a capacity of 100,000 gallons. Water is delivered to the reservoirs from the 6" pipeline through a two-way valve which opens into either tank.

In the first instance both basins were filled and it was found that about 48 hours were required for the suspended matter to settle to the bottom of the tanks which are cement lined and the floors of which slope away from the partition wall towards a deep drain running along the outer walls. The mud and other impurities gradually find their way to this drain and when the tank is nearly empty a sluice gate at the end is opened and the whole tank is thoroughly scoured before being refilled. Whilst one basin is being filled and the water settling, the feed water is being drawn from the other and so on.

From the settling tanks the water, which is quite clear, is delivered by a centrifugal motor pump to the feed water tank elevated outside the station boiler house. The pump motor is controlled by an A. E. G. patent automatic controller the operating of which is governed by a float and switch attached to the feed water tank.

Before entering the boilers the feed water passes through a further process of purification by means of a B & W filter which as before stated is inserted in the delivery pipe between pumps and feed water heater, the water in the boilers therefore is as pure as possible and so far frequent cleaning of the tubes has not been found necessary.

The selection of the site for the Power Station also presented much difficulty and owing to the impossibility of carrying machinery through the narrow streets, the plant could not be installed at the centre of distribution. A site was eventually chosen near the Tai Ping Men and here were erected the massive buildings in which the installation is housed.

The engine room of the station is 82'-6" long and 41'-6" wide and the boiler house the same length but 45'-0" wide, the walls are all 25'-0" high. The structure is erected on foundation of blue stone and is built of black brick with red brick facings; the engine room floor is tiled, and that of the boiler house laid in stone flags. The stack is 150'-0" high from base to top of cap and 7'-6" internal diameter at top and the main shaft stands on a pedestal of blue stone 21'-0" high set in cement. From the pedestal the circular shaft runs up with a batter of 1 in 42 to the stone cap which crowns the structure. The outer brick courses of the stack are all headers. An underground flue connects the stack with the boilers. Of course the stack is far in excess of present requirements but both it and the buildings were designed for a total output of 2000 K.W. which output must sooner or later be reached.

Considering the remote region it is situated and the difficult means of transport to Chungking, the contractors for supply and the native Company for the assistance they gave in erection are to be congratulated. The contract for the supply of the plant was signed on the 28th July, 1909, and on the corresponding day in 1910 the engines and dynamos had passed the load tests in Chungking and public supply was available from September 15.

The arrangement of the plant, the buildings, stack, and water supply system were designed by Mr. P. Edward Nettle who went to Chungking at the close of 1909 to superintend the erection of the buildings and later on the plant itself. Mr. Nettle is now the engineering representative for Messrs., Arnhold, Karberg & Co., in West China.

The plant was handed over to the care of native engineers on the 1st October, 1910, and up to the present everything has worked smoothly. During the past 12 months some 8000 lamps have been connected to the mains and the demand for electric lighting is constantly increasing. In fact the Directors of the Company are seriously considering the extension of the plant from which it may be gathered the undertaking is proving remunerative.

A charge of $1 per month is made for a 25 candle power metal filament lamp, other powers in proportion, and no meters are used. It is expected that in the near future the option of paying per flat rate or by meter will be left to consumer, and in the case of payment by meter a rate of .15 tael cents per unit is proposed.

## COAL DEPOSITS IN SUMATRA

*Coal mining* has for many years been successfully carried on at Ombilien almost the whole output being consumed by the steamers of the Royal Dutch Packet Company. The mines are under Government control and are worked to a great extent as a convict settlement, prisoners undergoing long sentences being sent here to work out their term. No attempt is being made to build up an export trade although the coal is of excellent quality. The mines are connected with Padang by a line of railway 90 miles long including a stretch of rack railway.

Another coal field about to be opened up is situated towards the South of the West coast of Sumatra about 20 miles East North East from the port of Benkoelen which is about 400 miles by sea from Batavia. It is held under lease from the Government for a period of 75 years. The property has been bored to prove the continuity of the numerous outcrops and for the purpose of estimating the quantity of coal contained. Altogether there exist outcrops for considerable lengths along their strikes of 10 or 11 seams of an aggregate thickness of 36 feet which absolutely proves a substantial quantity of coal which can be mined with apparetly thin cover to a level of the beds of the rivers and with the most elementary appliances.

At the head of the Pegambier River lies a bed of coal 36 feet thick without any partings of importance. It is very probable that this seam is made up of the closing together of the other seams in that direction, a common occurrence in many coalfields. The following is the section of the more important seams.

| | | | |
|---|---|---|---|
| No. 1 Seam. | Coal | 3′ | 9″ |
| | Parting | | 4½ |
| | Coal | 4 | 2 |
| | | 8′ | 3½″ |

No. 2 Seam: 4 feet thick without any parting, these seams dip 15 deg. South West.

No. 3 Seam. Still higher up the same river and about a mile from No. 1 seam a splendid and imposing seam of coal is in view for about 200 yards along its dip. A grander scene of river torrent, tropical vegetation and coal seam it is impossible to conceive. This seam, if continuous to the dip, and there seems no geological reason why it should not continue, is of immense value—indeed the regular occurrence of the other two seams about a mile below it would certainly imply its continuation for at any rate that distance The seam has the following section dipping 9 Deg. S.W.

| | | | |
|---|---|---|---|
| | Coal | 2′ | 0″ |
| | Parting | | 2 |
| | Coal | 6 | 0 |
| | | 8′ | 2″ |

No. 4 Seam. On the bank of the river Simpoer a seam 2′ 7″ without any partings, dipping 24 Deg. S. W.

No. 5 Seam. Close to the river Gambier, 3′ thick dipping 25 Deg. N. W.

No. 6. On the western boundary Dipping 42 Deg.

| | | | |
|---|---|---|---|
| | Coal | 2′ | 3″ |
| | Parting | | 7½ |
| | Coal | 3 | 3 |
| | | 6′ | 1½″ |

The Nos. 1, 2 and 3 Seams give about 20 feet in thickness of coal and in themselves constitute a valuable coal field, as nearly two-thirds of the concession geologically contain these under good cover and from their proximity they could be worked simultaneously.

There is evidence that workable coal does not exist over the Northern third of the concession, but if for the total thickness as proved of 36 feet, coal existed over the remaining two-thirds of the concession, the total workable coal contents would exceed a total of one hundred and fifty million tons.

The coal from all the seams is black with very bright lustre and conchoidal fracture. The quality does not seem to vary and it would be classed as a good bituminous coal. Open fire tests on the spot gave very satisfactory results considering the coal was from outcrops and had been exposed to the elements for ages.

Analysis of the coal proves it to be superior to that of any other coal field working in the East.

# *THE KWANGTUNG SECTION OF THE CANTON-HANKOW RAILWAY

"The construction of a trunk line, connecting Hankow, or rather Wuchang, immediately opposite Hankow, on the south bank of the Tangtze, with Canton, was first advocated by Sir MacDonald Stephenson. In ever subsequent scheme for a comprehensive system of railways in China, such a line has occupied a prominent position. Yet though the necessity, or at least the desirableness, for its construction, is so great, as to be almost axiomatic. but very inconsiderable progress has as yet been made towards that end." Thus writes Mr. P. H. Kent in his able work, "Railway Enterprise in China" with reference to the Canton-Hankow Railway, and anyone, desirous of studying the history of railways in particular, can not do better than carefully peruse this book.

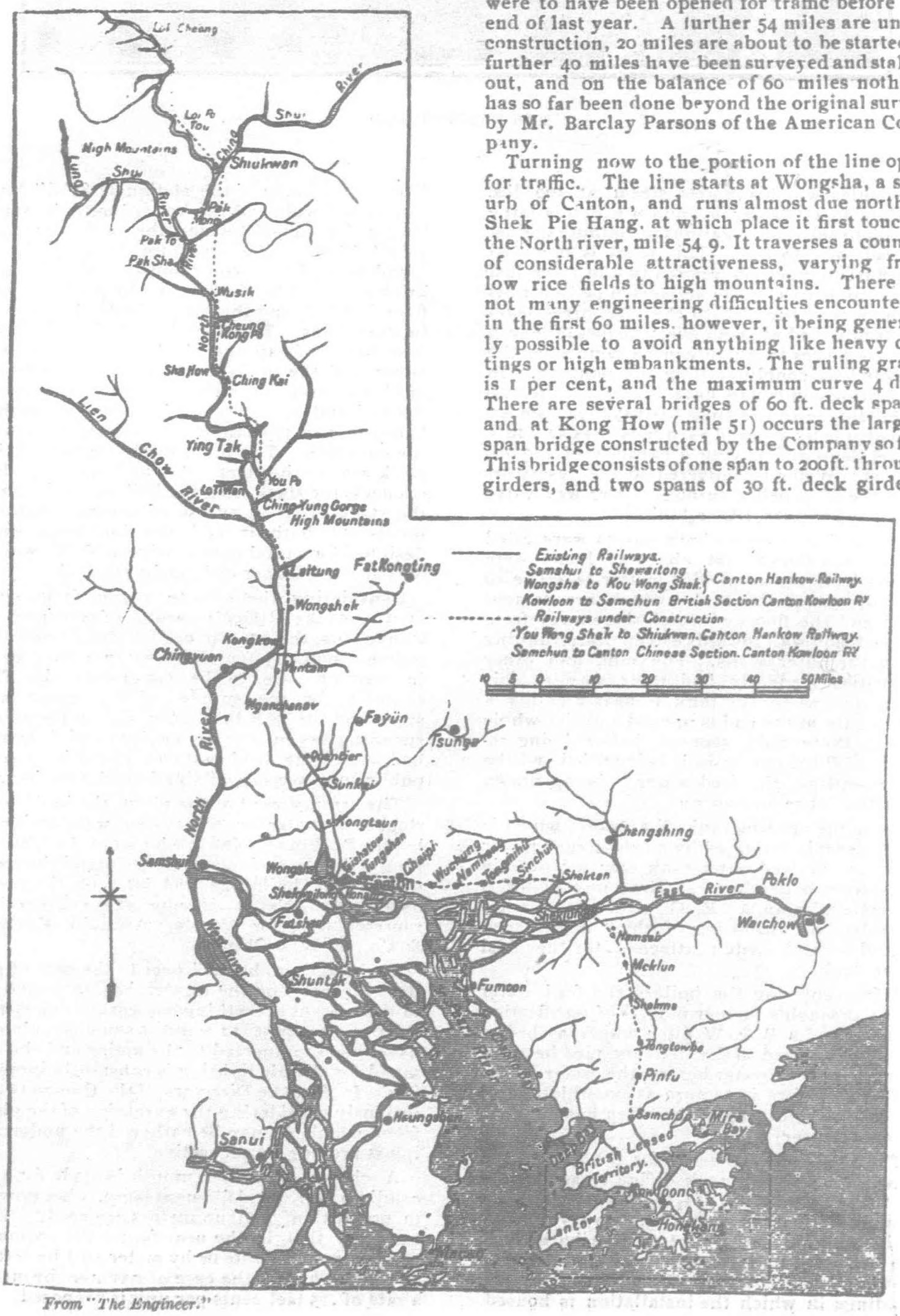
As regards the early history of this undertaking, we may say that the original concession for the construction of the whole line of over 700 miles was given to an American company—The American China Development Company. From it, it passed temporarily into the hands of the Belgians, then the Americans regained control, and, finally, it rests in the hands of the Chinese themselves. All the work that was done by the Americans was the construction to completion of the branch line from Shek Wai Tong (on the opposite or south side of the river to Canton) to Samshui on the West river, a distance of 32 miles, and the partial completion of 50 miles of earthwork on the main line northwards from Canton.

When the American Company was finally persuaded by the Chinese to retire from the field, which it eventually did upon receiving compensation to the extent of 6,750,000 dols., gold, for the work it had done and the two surveys of the main line, a Joint Stock Company was formed by Cantonese merchants, under the name of "The Kwangtung Mercantile Administration of the Yuet-Han Railway Company, Limited, to carry on the work. This Company, formed with a capital of 40,000,000 dols. Cantonese currency (about £3,636,000 sterling), intends to construct the line only through the province of Kwangtung, of which Canton is the capital, and it is with this portion only of the Canton-Hankow Railway that it is proposed to deal. Very little, if any, work has been started in the provinces north of Kwangtung and there is, in consequence, little to write about. Shares were issued of the value of 5 dols. (8s 9d.), price of the shares being so low nearly every coolie and person of the lowest classes who could muster a dollar became a shareholder, hoping thereby to obtain lucrative employment upon the line. Though there is, of course, not enough work on the line to employ all the shareholders, it is nevertheless a fact that only shareholders in the Company are employed, no others, except foreigners (who can not hold shares), being considered. In 1909, the call for the second payment on the shares of 1.50 dols. is about to be made. There will undoubtedly be trouble in collecting it. The total capital of 40,000,000 dols. is equivalent in a length of 240 miles to about £15,000 per mile, but it is proposed, when the main line is completed, to build numerous branches. The cost of the main line is estimated to be between £6,000 and £7,000 per mile.

By the rules of the Company, only a Cantonese is eligible for the appointment of Engineer-in-Chief, and also the President, Vice-Presidents, and members of the Board of Management must be Cantonese. Foreign engineers are employed under the Chinese Chief Engineer, the Company recognising that it can not do without foreign assistance in carrying out this big enterprise. At first, marked preference was given to Canadian engineers, trained on the Canadian Pacific Railway, but, latterly, all the Canadians have left and the line has become more cosmopolitan in character. At the time of writing there are nine foreign civil engineers employed, made up of different nationalities, as follows:—five Japanese, three Americans, and one Englishman, and the superintendent of motive power, who is an American, making ten foreigners in all. The Chief Storekeeper, Accountant and Secretary, are Cantonese. All drivers, guards, stationmasters, platelayers etc., are Cantonese. The head administrative offices of the Company are within the walls of the City of Canton, the workshops, engineer-in-chief's offices, etc., at Wongsha, a suburb of Canton, and the terminus of the line. The late President of the Company, Sir Liang Cheng Tung, having been appointed Ambassador at Berlin, has been succeeded, after a year's interval, by His Excellency Jeme Tien You, Consulting Engineer to the Board of Posts and Communications and a Director of the Imperial Pekin-Kalgan Railway.

Coming now to the line itself, the standard gauge of 4ft. 8½ in. has been adopted, and the length to be constructed in the Province of Kwangtung is, approximately, 240 miles, 58.5 miles are, at the time of writing, open to traffic, 7.5 miles have the permanent way laid. They were to have been opened for traffic before the end of last year. A further 54 miles are under construction, 20 miles are about to be started, a further 40 miles have been surveyed and staked out, and on the balance of 60 miles nothing has so far been done beyond the original survey by Mr. Barclay Parsons of the American Company.

Turning now to the portion of the line open for traffic. The line starts at Wongsha, a suburb of Canton, and runs almost due north to Shek Pie Hang, at which place it first touches the North river, mile 54.9. It traverses a country of considerable attractiveness, varying from low rice fields to high mountains. There are not many engineering difficulties encountered in the first 60 miles, however, it being generally possible to avoid anything like heavy cuttings or high embankments. The ruling grade is 1 per cent, and the maximum curve 4 deg. There are several bridges of 60 ft. deck spans, and at Kong How (mile 51) occurs the largest span bridge constructed by the Company so far. This bridge consists of one span to 200ft. through girders, and two spans of 30 ft. deck girders.




*From "The Engineer."*

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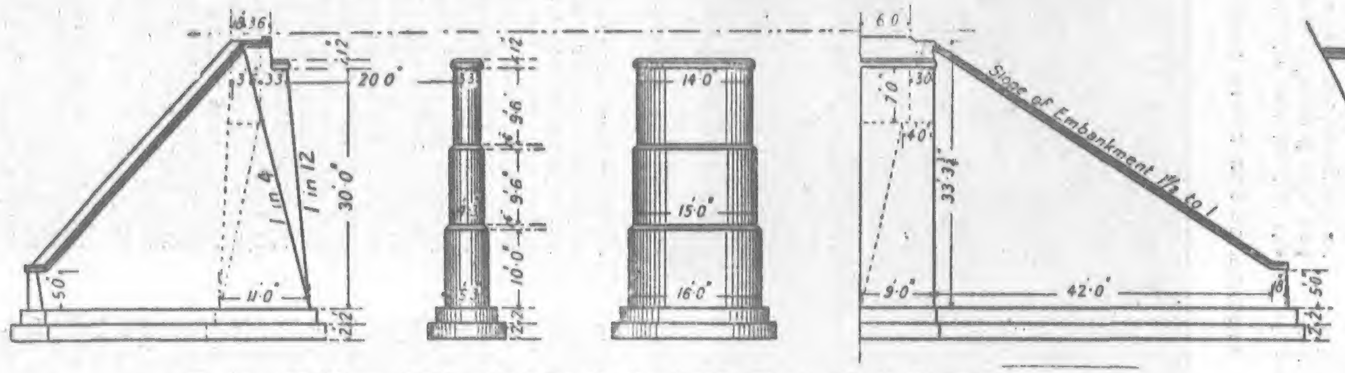
The only drawback connected with the exploitation of this valuable coal field is the cost of building and equipping a railway to transport the coal to the coast, an approximate mileage, including sidings, of 20 miles. The cost of winning freight and general charges would be such that coal could be landed at the seaboard at a cost not exceeding 5s per ton. In comparison with the selling price of other coals, the Boeket Soenoer coal should have a clear margin of profit of not less than 5s per ton, and probably of 10s per ton which gives enormous value to the concession. It is certain that in the near future this will become one of the important centers for supplying the growing demands of the Eastern market.

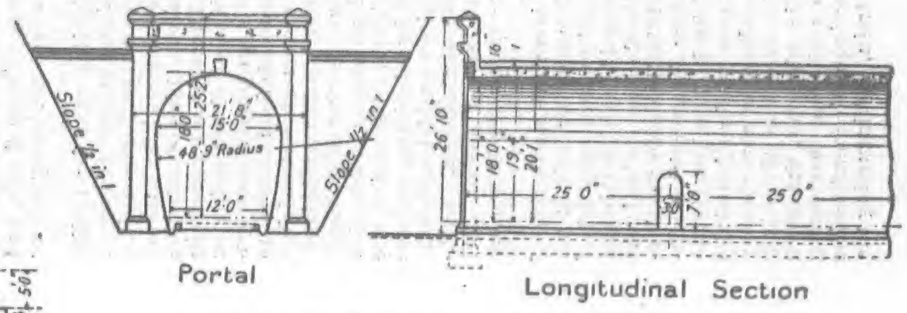
The above is a condensed extract from a report on the property by Mr. T. Parton, F. G. S., etc., of Sydney, Australia.

*From "The Engineer."

# SOME TYPICAL CONSTRUCTION ON THE CANTON-HANKOW RAILWAY



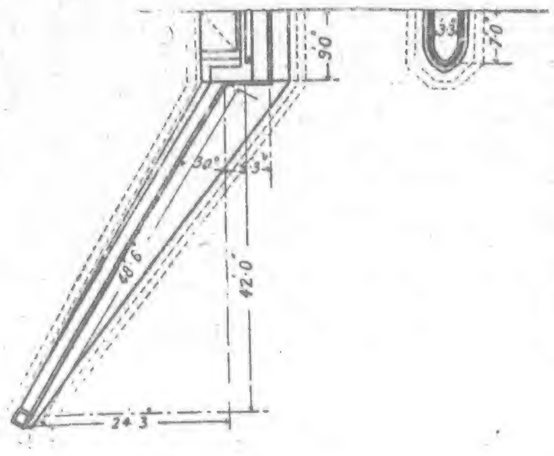

Type of Wing Wall Abutment and 30 Feet High Straight Pier.

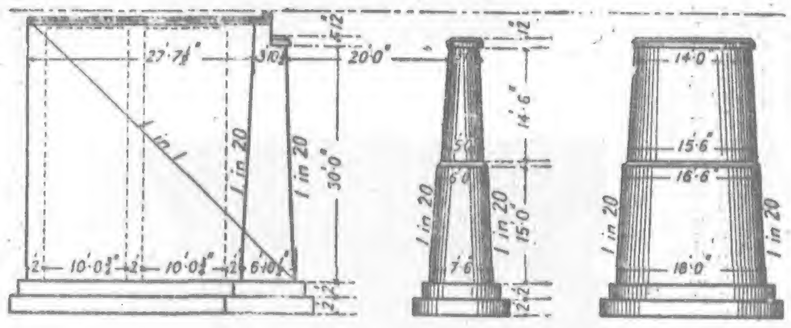



Portal

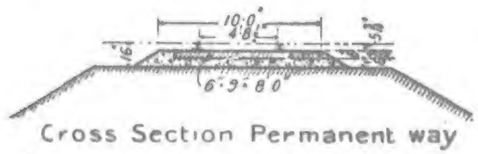
Longitudinal Section

Type of Tunnel in any Material.

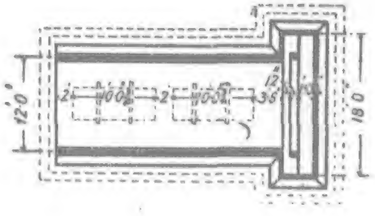


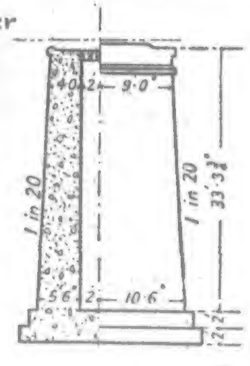




Type of T Abutment and Battered Pier
For 30 Feet High and Over



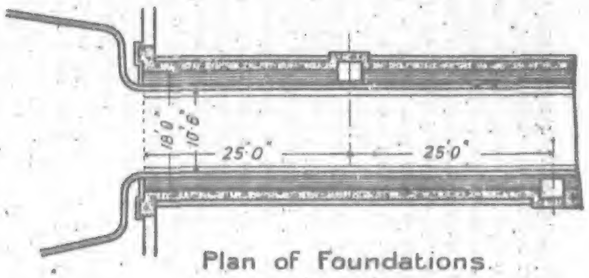

Cross Section Permanent way
85 lb Rail.



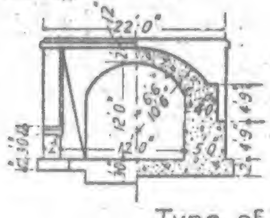



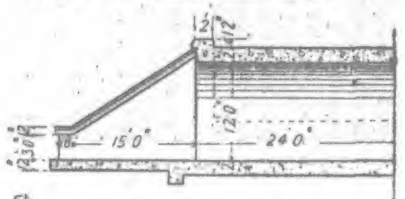


Cross Section.

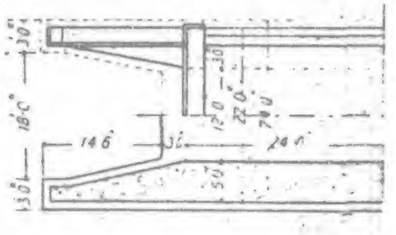



Plan of Foundations.




Type of 12' Arch in Concrete




*From the Engineer*

The 200 ft. span is of the whipple type, and was designed by Messrs. Baker and Hurtzig, of London The girders rest upon cement concrete piers and abutments, these being supported upon piles.

There are on the open line four bridges of one or more spans of 60 ft. deck girders, the largest being at mile 12, where there is a bridge of 15 spans of 60 ft. There are also three bridges of one span each of 40 ft. and many of 30 ft. and 20 ft. spans. All bridge piers and abutments as well as arches and small culverts are constructed of Portland Cement concrete, proportions for all work, except arch rings being one cement, three sand, and six stone. Arch rings are of the proportion of one cement, two sand, and four stone.

The Canton district and indeed the w ole of the area traversed by the railway is liable to sudden heavy flo ding. The largest flood occurred in June, 1908, when there was a rise of over 30 ft in the North river. Such a flood had not been previou-ly experienced within knowledge, and as a consequence many bridges had to be raised, formation level throughout had to be raised and in some cases an entirely new alignment of parts of the line had to be undertaken. All this, of course, occasioned much delay, but it is now practically certain that the brid es are adequate for any future floods, and that the embankments will not be topped or washed out.

On the portion of the line open for traffic, there are, excluding Wongsha, the terminus, 15 stations situated at an average distance of 3.9 miles apart. At all these stations loop lines are provided for crossing trains. Otherwise the line is single throughout. There are no signals in use, and no locks provided on either facing or trailing points. There is no proper block system. Permission to proceed from station to station is given by the stationmaster to the driver and guard, after the former has first ascertained, from the station in advance that the line is clear, and has received permission to despatch the train. On the train leavin g the station, the station ahead is advised by telephone, and the driver of the train is given a tablet which he delivers on arrival at the next station. Without a tablet no train can leave a station. All points over which the trains are to run are manned by pointsmen.

At Wongsha, which is on the north side of the Canton river, the Company owns about 500 lineal feet of wharfage, and ocean-going ships of light draft can come alongside at high tide and discharge direct on to the Company's land. As it is intended to connect the line with the Canton-Kowloon Railway, now also under construction considerations of the final designs for the Wongsha terminus are as yet deferred, and the station can only be considered as a temporary one at present. On the open line there is at present no goods traffic whatever, the short length of line open to traffic not warranting consignors from transferring their merchandise from the river to the train, and incurring the expense of double handling, when they can get boats to take their goods right to their wharves in Canton. Time being of little object to the Chinese, the three days taken by boat to Canton do not weigh with them so much as the expense of double handling, and until the line has got to a distance of 150 or so miles from Canton, it is not thought that the amount of goods traffic will be worth considering. On the other hand there is a heavy passenger traffic, principally third class, to cope with which there are at present five trains running daily each way, Sundays included.

The Chinese are inordinately fond of travelling and do not object to paying for the privilege. With regard to passenger fares the rates from Wongsha to Kou Wong Shek, the present end of the open portion, are as follows: third-class single, .85 dols.; second-class, single 1.55 dols.; for first class, single 2.55 dols. For a distance of 58 5 miles this is equivalent to—for third-class .3 pence per mile; for second-class, .55 pence per mile, and for first-class, .93 pence per mile. These prices for travelling compare favourably with any other railway from the passengers' point of view. The e is no doubt, however, that as soon as the public have found it a necessity to use the train for travelling, and have become used to it, passenger fares will be raised all round.

Passengers, who now desire to proceed from Kou Wong Shek to places higher up the river, take passenger stern-wheel steamers which meet the first train from Wongsha. These steamers, which do not belong to the Railway Company, make the large town of Ying Tak, at mile 85, the same day. To Shiukwan, however, situated at mile 140, and the most important town touched by the main line, it is sometimes possible to obtain a steamer, in which case passengers arrive in two or three days from Canton, but more generally, on account of low water in the river, native flat-bottomed boats have to be taken from Ying Tak, in which case four to six days can easily be taken on the journey from Ying Tak, or five to seven days in all from Canton.

All stations are constructed of red brick set in lime, and besides providing the usual offices and waiting rooms, have an ample overhanging verandah on the platform, and quarters for the station master, telegraph operator and pointsmen. Platform walls are of concrete 14 in. above the rail level, and have a ramp of 1 in 5 at the ends. The road bed is well ballasted, having a minimum of 6 in. of good stone under the sleepers. Sleepers are of Jarrah wood obtained from Australia.

The rails which are flat bottomed are of 85 lb. per yard section, and are obtained, together with all fastenings, from the Hanyang Iron and Steel Works, a Chinese concern at Hankow.

Locomotives, of which there are 25, are all of American make, the American Locomotive Company being responsible for most of them. The heaviest engines, type E, weigh with tender, 238,000 lb., or 106 tons English, and are of the 2-6-0 type with a double four-wheeled bogie tender. The diameter of the driving wheels is 56 in., that of the leading wheel, 33 in., and of the bogie wheels on the tender, 33 in. The weight on each pair of the coupled driving wheels is 35,000 lb., or 15-6 tons English. The rigid wheel base of the engine is 14 ft. The cylinders are 19 in. diameter by 26 in. stroke, the boiler pressure being 180 lb. The heating surface is 2,020 sq. ft., and grate area, 30.3 sq. ft. The water capacity of the tender is 5,000 gallons, and the coal capacity nine tons. The tractive power on the draw-bar is 24,100 lb. The fuel used is Japanese coal of rather poor quality.

The rolling stock at present on the line consists of the following:

| *No.* | *Nature* | *Dimensions.* | *Capacity.* |
|---|---|---|---|
| 2 | Directors' cars | 60′×9′×10′6″ | |
| 2 | 1st & 2nd Compos | 6′×9′×10′6″ | 34, 1st; 22, 2nd. |
| 10 | 2nd class " | 60′×9′×10′6″ | 60 |
| 20 | 3rd class " | 60′×9′× 6′6″ | 96 |
| | Coaches are 26 tons tare | | |
| 2 | Baggage cars | 40′×9′×10′6″ | 30 tons net. |

GOODS STOCK.

| | | | |
|---|---|---|---|
| 2 | Goods cars | 32′×9′ 8″ | 30 tons net |
| 18 | Flat wood cars | 36′×10′ | 30 " " |
| 20 | High side " | 60′×10′ | 30 " " |
| 130 | Low side | 32′×10′×2′6″ | 30 " " |
| 6 | Steel Goods, | 32′×10′×2′ | |
| 4 | Steel brake vans. | | |

All the rolling stock has centre buffers and automatic couplers of the Master Car Builders pattern, and all vehicles, whether goods or passenger, are fitted with the Westinghouse automatic brake.

Turning now to that portion of the line under construction, permanent way, unballasted, is laid as far as mile 67. As already mentioned the line joins the North river at mile 54.9. From this point onwards the work becomes of a much more interesting character from an engineering, as well as from a scenic, point of view. High hills come right down to the water's edge, and the work is a succession of cuttings through the ridges of these hills and filling up the valleys between the ridges. The gradients are very easy, generally, the line rising from 15ft. above mean sea level at Wongsha to 310ft. above the same datum at Shiukwan bridge, mile 140.

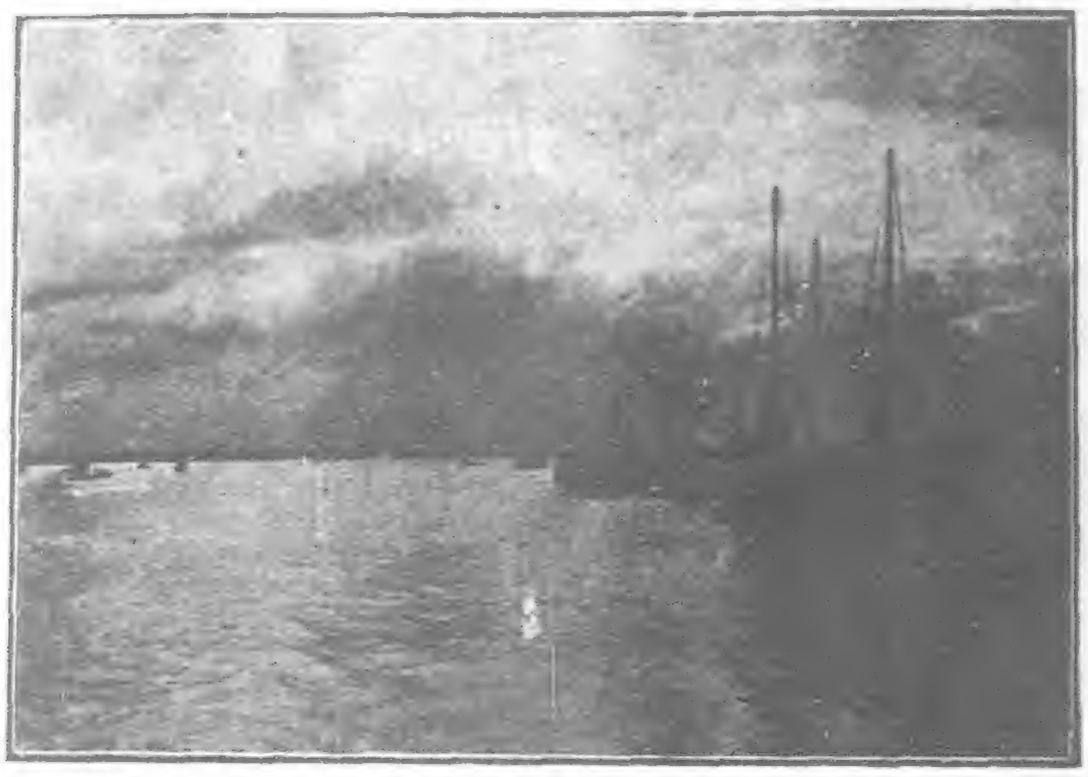
At mile 66 occurs the first tunnel which is completed and about to be opened. It is only some 270 ft. long, and is through hard sandstone, which had to be blasted. It is nevertheless lined with concrete 18 in. thick down to 2 ft. below formation level. Two engravings of this tunnel, one during construction and the other after completion, are given on this page. The cost of this tunnel is given as 148 dols. per lineal foot, equivalent to £12 19s. sterling. We cannot, however, vouch for the accuracy of th s figure.

As already mentioned, the formation level of all cuttings and embankments had to be raised after the experience gained during the

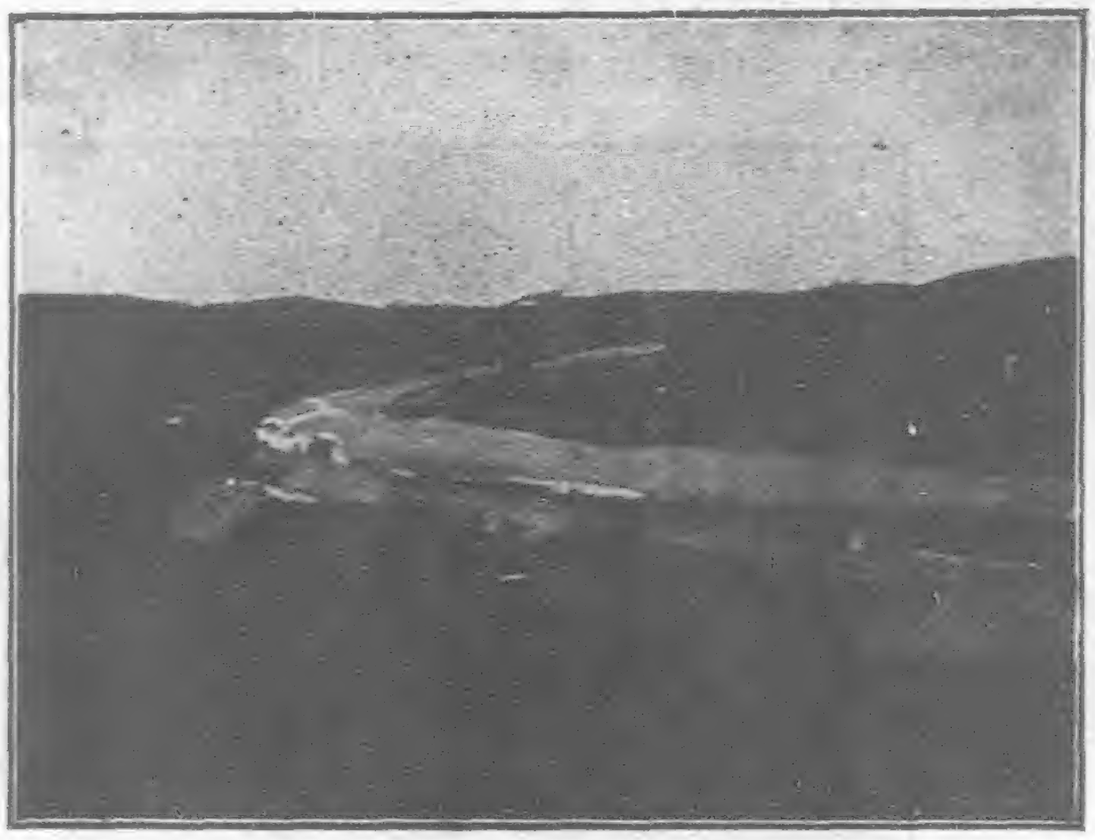
CONCRETING TURNTABLE AT WONGSHA

TEMPORARY STATION AT TAI KAN KIU

terrible floods of June, 1908. This was a source of great delay in carrying on construction, but there are other and worse delays, caused by the Chinese landowners on the right of way. On account of some peculiar god or devil which a certain hill or piece of ground is supposed to harbour, no inducement will make the owner sell that land, and many and grave troubles have been encountered, some of which are still going on and have been for two or three years. For instance, at mile 68, there is a stretch of land of very short length upon which is situated the grave of the head villager's mother. As a general rule graves on the right of way afford very little obstruction, it being the practice of the Railway Company to pay 6 dols. to the nearest relative of the deceased, who then exhumes the remains, puts them in a large earthenware jar, and either reburies it or stands it on the hill side clear of the line of works. In this case, however, strong opposition has been offered, the head man, who is very wealthy even going to Peking to lay the matter before the Throne. In the end, force will undoubtedly have to be used, though the Company recognises that this is only a last resource.



THE NEW RAILWAY WHARF AT WONGSHA



SOUTH FROM TAI KAN KIU

At mile 83 also, even graver obstruction is offered. In this case three villages have combined to prevent the Railway Company buying any of their land, and it is quite possible that very serious bloodshed will occur here before the villagers are forced to give way. These villagers prevent all work proceeding, even work of quite a preliminary nature, threatening the engineer and his staff, and obliging them to withdraw. In this case there are no graves in question, the villagers object to the line passing so near their villages (about 30 ft.) and have indicated the one and only line they will accept. As their line is over 1,000 ft. away from the present centre line and quite impracticable from an engineering point of view, matters are at a deadlock.

From mile 55 the line runs parallel with the North river, leaving it between miles 78 and 107, running parallel to mile 120, and from there striking well inland until it again joins the river at Shiukwan, mile 140. Between miles 75 and 78, the line runs through a precipitous, rocky gorge of the river, and on this length which is so far the heaviest portion undertaken, there are three short tunnels of 300 ft., 150 ft. and 200 ft. length respectively. All these tunnels are through rock, and all will be lined to below formation level with concrete.

The bridge at mile 85 is 750 ft. long, and it was originally proposed to build 13 spans of 60 ft. deck girder. Considerable difficulty, however, was experienced in driving the foundation piles in some of the piers, and the original design has been abandoned in favour of three spans of 200 ft. through girders, two spans of 60 ft. and one span of 50 ft. deck girders. This peculiar arrangement is accounted for by the fact that the first pier together with the two abutments, has been partially completed, and it is desired to utilize these structures in the new design. The 200 ft. span piers will be founded upon steel wells, these latter now being made by the Company at Wongsha. The 50 ft. piers will be founded upon piles driven in cofferdams.

It is not in contemplation to use compressed air for the well sinking, but there is little doubt that eventually it will have to be used. The nature of the substrata is a matter of considerable uncertainty in the case of this bridge; the Company never having made adequate borings to ascertain this most vital point. It is conjectured that underlying the surface sand and small stones, good stiff clay will be met with at a depth of 30 ft. or so below low-water level, and upon this conjecture the foundations of the bridge have been designed. It is extremely probable from one or two indications that have become manifest that large boulders are likely to be encountered during the well sinking, and these may be so large and so numerous that compressed air will have to be resorted to. Tenders for the entire construction of this bridge have been called for, but have so far met with a poor response, Chinese contractors probably not feeling competent enough, or willing to take the undoubtedly big risks attending such a work. No foreigner can submit a tender for any work upon the line, though it is true that there are one or two foreigners—Italian and French—who are employed by the Chinese as sub-contractors.

To mile 106 there is very little of any engineering importance to recount. Earthwork is proceeding steadily, but very little bridge work is in hand, in fact, between miles 70 and 120 no bridge work whatever is going on. There are several reasons for this peculiar state of affairs. Originally, all bridges of whatever size, were constructed by the Company itself, contractors only furnishing the necessary sand and stone for the concrete. This method of departmental working proved exceedingly expensive, as on many occasions the supply of cement gave out at a critical period during the construction of the bridge; but labour gangs and foremen had to be retained ready for the arrival of a fresh supply of cement. In March last year, however, the practice of using departmental labour was stopped by order from Peking and work by contract ordered instead.

Owing to the very small number of contractors in South China familiar with and experienced in the correct methods of mixing concrete, putting up shuttering, etc., it has been, and still is, a matter of great difficulty to get good men. A small body of these contractors, and the same small body invariably, submit tenders for bridges when they are advertised, and as nothing is known of these men or their capabilities it has been wisely decided to give each contractor a small culvert first, to discover his capabilities, before letting him have any other work; and, consequently, while the capabilities are being proved on these small culverts, there are many large culverts and bridges still untouched.

Bridge work contractors are required to be responsible for the bridges they build for a period of 12 months from date of completion. This is a sound clause in the contract where concrete work is concerned, as it undoubtedly has deterred many inferior and inexperienced contractors from coming forward, but it, of course, does not relieve the engineer of the very arduous work of personal supervision of every bridge constructed.

Up to the time of company work on bridges, cement manufactured near Hong-Kong by a foreign company, and known as "Green Island" cement, was almost invariably used. A little German cement (Alsen brand) had been used for foundations under water, and for arch rings, but its use has been abandoned. A Chinese company has built a cement works in Canton, and the Railway Company intends to utilize this cement exclusively in future structures on the principle of supporting home industries. As to the quality of the Chinese cement it is a little early to form any opinion. Stone supplied for concrete is an excellent quality of limestone, of which the hills bordering the line provided unlimited quantities. The size for concrete is 1 in. to 1½ in. Sand is obtained from the river, in many cases within 20 ft. of the work for which it is required. The sand generally is of an uniform excellent quality. Foundations for bridges are generally piled, even the smallest culverts having as many piles as can be conveniently driven. Probably no works of a similar nature anywhere have gone in so strongly for piled foundations.

At mile 140 the east fork of the North river is crossed by the line of railway. The width of crossing here is 800 ft., and it is proposed to carry the line over by means of four spans of 200 ft. through girders. No difficulty in the construction of this bridge is anticipated. At an average depth of 25 ft. below the surface of the bed, limestone rock in a level stratum is found, and it is proposed to sink steel cylinders on to this rock in the case of two of the piers. The remaining pier and two abutments will have open foundations. No tenders for this bridge have so far been called for, as the Company intends to complete the line open for traffic to Shiukwan (mile 139.½) before proceeding further with construction of any sort.

Shiukwan is a city of 60,000 inhabitants and is the principal place in Kwangtung touched by the main line. A large passenger traffic is anticipated from here and from the surrounding small towns and villages.

For the purposes of construction the line is divided up into sections of ten miles each, in

charge of which is a resident engineer, whose quarters are placed as nearly as possible in the middle of his section. He is provided with a paymaster who is responsible for the financial matters, a clerk, storekeeper, and interpreter. This latter individual is very necessary, as it is next to impossible for any foreigner to learn the Chinese language without giving two years exclusively to the study of it, which, in the case of an engineer, is impossible. The resident engineer is also provided with a guard of from 12 to 20 soldiers, who are under a captain, and who are armed with old pattern, but serviceable, Mauser rifles. This guard is at times a necessity in cases of trouble with villagers, and though the soldiers are not soldiers in anything but in name, being recruited from villagers themselves, they are as a rule loyal to the engineer, and can be trusted to protect him in cases of trouble, since failure to do so means decapitation.

The engineer, in order to get about his section, is, in cases where there is a road, provided with a pony, his interpreter and Chinese assistant engineer also having ponies. In cases where the section runs alongside the river, a small motor launch burning petroleum is provided for him to get from one end of his section to the other. His quarters are constructed of wood and consist of one or two bedrooms, dining room and office. Fireplaces are a necessity, as from December until the end of March bitterly cold winds blow from the north across the great Gobi desert. The sun is seldom seen during these months, the sky being heavily overcast, though there is little or no rain. In March last year here was slight frost at Shiukwan for several nights.

The months of July, August, and September are hot, but on the whole the climate is very good, and sickness amongst foreigners rare. There are mosquitoes, and consequently malaria, but not of a serious kind. Living is exceptionally cheap—chickens, eggs, ducks, pheasants and partridges being abundant Vegetables of all sorts are plentiful, but are seldom eaten by foreigners owing to the peculiar methods of cultivation adopted by the Chinese.

Coming now to the cost of construction: for earthwork, the company advertises in the Chinese newspapers that such and such a section containing so many cubic yards in embankments and cuttings is to let, the tenderers being asked to name a lump sum for which they will do the whole section. Generally, into the lowest of such lump sums received in reply the number of cubic yards of earthwork is divided, and the successful contractor is told he can proceed with the work at the resulting price per cubic yard.

For all soils except rock he is paid this amount per cubic yard, but for rock he is paid 1 dol. per cubic yard, the Company supplying him with explosives if blasting is necessary.

As the contractor is paid for all earthwork in both cuttings and banks it is obvious that the longer the distance he can get his coolies to lead excavated soil from cutting without payment, the greater profit to himself on the contract. If the work is sufficiently big to warrant him buying or hiring temporary small gauge track with tip wagons, his profits increase at a great rate. In some cases earth from cuttings has been led a distance of three quarters of a mile, the contractor paying his coolies only the cutting rate. In cases where opening for bridges have to be left in an embankment temporary bamboo bridges are put up and the small gauge track carried across it.

The quantity of earthwork in a section of 10 miles varies between 700,000 to 1,250,000 cubic yards of cutting and embankment. Of these amounts about 10 to 30 per cent. are rock. The prices for earthwork obtained by the method mentioned above have varied between 10 cents to 15 cents per cubic yard, the higher price being for through cuttings (2.1 to 3.15 pence per cubic yard) Prices for bridge work are as follows: cement delivered by the Company into its section storehouses varies from 4.80 dols. to 5.50 dols. per barrel of

TRAIN AT WONGSHA

375 lb., depending, of course, on the distance it has to be carried from Canton. Sand for concrete ranges between 6 dols. to 14 dols. per ching of 7 cubic yards. The latter price is for cases where the sand has to be carried in baskets by coolies over perhaps two or three miles of rice fields to the bridge site. Broken limestone varies from 11 dols to 23 dols. per ching for the same reason. The prices paid to contractors for labour only in bridge work, that is, labour in mixing, depositing and ramming concrete, as well as putting up and taking down shuttering, have varied from 1 25 dols. to 1 65 dols per cubic yard, and for specially large and high piers up to 2 dols. per cubic yard. Very careful supervision by the resident engineer in person has been necessary when this method of bridge construction has been in force.

Now, according to the new system adopted since March last year, contractors take over the whole work of construction, and provide all materials including cement, but not the shuttering. In addition, as already mentioned, the contractor takes all responsibility for the bridge he has constructed for a period of twelve months from the date of completion. The average price submitted by contractors to date for minor bridges up to 20 ft. span and small culverts has been 52 cents per cubic foot, equivalent to 14 04 dols. per cubic yard, or 24s. 6d. English. For larger bridges the price has been 17 dols. per cubic yard and for the Ying Tak and Shiukwan bridges it will, of course, be much higher, probably 24 dols. to 30 dols. per cubic yard.

The exclusive use of cement concrete for bridge construction is open to some criticism. Excellent limestone in unlimited quantities exists practically all along the railway, and never more than one or one-and-a-half miles away.

In former times the Chinese built all their bridges—of which there are numbers along the river banks—solely of this limestone, and the excellent workmanship in the arch rings proves that they possessed considerable skill in dressing the stone. Single spans of 16 ft. in one slab of limestone exist in many places.

On the other hand, it is said that any coolie can be easily and quickly trained to mix concrete, and this being so, the Company would not be in the hands of the stonemasons, as it would be if masonry for bridges was adopted. It is also contended that concrete is cheaper than masonry. This may be true for places close to Canton, but is not so at places further away, the cost of cement transportation being very high after the first 30 miles from rail head. A good quality of lime is, however, made by nearly every village for its own uses, and there seems no reason why the Company should not use this lime for stonemasonry work, if necessary using cement for the face joints.

Nearly all native houses in this part of China are built of brick in lime. These bricks are of nearly the English size 9 in. × 4 ½ in. × 3 in., and make very neat work. They are of a blue colour, and are generally under burnt. This defect could easily be remedied, and there appears to be no reason whatever why these bricks should not be used for small arch culverts and minor bridges. The price of these local bricks is 7 dols per thousand.

The excessive width of formation in cuttings seems also open to criticism. The width of 24 ft. for a single line is made up as follows: 18 ft., the standard formation width, plus twice 3 ft., the width at top of the side trains. Even in solid rock cuttings this width of formation is maintained. The one and only apparent reason for this width is that the railway will be, and indeed now is, used extensively by foot passengers as a highway, and this extra width is given to give them clear room away from moving trains. If this be the reason, however, it would seem necessary to widen the embankment to 24 ft. also, instead of the standard of eighteen.

With regard to wages given for day labour by the railway, these vary from 35 cents to 40 cents per day for ordinary labourers, depending upon locality. For interpreters, clerks, foremen, and storekeepers, the pay averages 40 dols. to 50 dols. a month; and for survey coolies from 18 dols. to 12 dols. a month.

With regard to Chinese foremen, very few are competent to supervise alone the construction in concrete of any but the smallest bridges, and a fewer number still can be classed as trustworthy and honest. As illustrating the untrustworthiness of foremen and Chinese contractors, it is related of a certain foreign engineer, who left the work of piling the foundations of a large bridge to the supervision of a Chinese foreman that on being advised by this foreman that the work had been completed, he noticed the, in what seemed to him, remarkably short time the work had been done Going down to inspect the work, preparatory to ordering the concreting to begin, he noticed when walking over the pile heads that many of them seemed loose. As these piles were supposed to be 30 ft to 40 ft. in the ground, he ordered the foreman to draw one for inspection. He then discovered that every pile had been cut off to a length of 4 ft. to 5 ft., and the remainder of the length carefully hidden away Needless to say the foreman lost his appointment that instant.

*With regard to Chinese engineers* there are undoubtedly men of great ability amongst them. The present Chief Engineer of this line, Mr. Kwong King Yang, is a man of high professional attainments. Unfortunately, few men of his calibre are available in South China. The Northern Country Chinese do not like working in the climate of South China, and the South Country Chinese do not go to the engineering university in the North for a similar reason. The Company has several young men employed as assistants to foreign resident engineers, and some of them are turning out well, but it will

be a long time, at any rate in South China, before the help of foreign engineers can be entirely dispensed with. These young Chinese assistants are generally excellently well trained from a theoretical point of view, but lack any practical experience or training. They show exceptional keenness in learning, however, and keep note-books constantly with them when on practical work. Most of them study American methods of construction and read American books. With regard to the treatment of foreign engineers by their Chinese employers, nothing but praise can be given. They are well looked after and protected, and are consulted freely as regards the various problems that arise in the work.

Looking now at the prospects of this railway from an earning point of view, so far there are no indications of any revenue to the Company. Not much in the way of goods traffic can be expected until the line is open to Shiukwan, when there may be considerable coal traffic developed. It is, however, not until through connection between Peking and Hongkong is established that any considerable goods traffic will accrue. As this is not likely to occur for quite ten years yet, not much more on this subject need be said.

This Company cannot complete its portion of the Canton Hankow railway for quite seven more years, and even this period can be looked upon as optimistic. Ten or twelve years is quite a probability. Beyond mile 180 very heavy rockwork is known to exist, and means of transporting materials are very bad.

That the railway when completed will prove an inestimable boon to the inhabitants of South China, can not be doubted, and as a means of opening up the interior of Kwangtung to mining and other enterprises, ist final and sucsesful completion is a consummation devoutly to be wished for.

SINKING CURB IS IN PROGRESS BY DREDGING SAND AND GRAVEL EMPLOYING CHINESE METHODS ON THE KWANG-TUNG YUET-HAN RAILWAY.

THE YING TAK BRIDGE ON THE KWANG-TUNG YUET-HAN RY.—ONE OF THE CURBS READY TO BE SUNK.

### LATER INFORMATION

The following data under date of November 22 on the progress of the work to date has been made available through the courtesy of the President and Engineer-in-chief of the Company, H. E. Jeme Tien Yew:

"Of the total length of 209 miles in this part of the Canton-Hankow Railway, 58 5 miles were completed and opened to traffic up to the end of the last year and another 7 25 miles have lately been added to the open line, making up a total of 65.75 miles. The line has thus far passed through the low-lying country, crossing a large number of minor bridges and culverts, except towards the railhead where there is heavy rock-cutting and a tunnel about 230 ft. long. Permanent station buildings, track houses and water tanks have been built along the open line with the exception of the Canton terminus station building which is in course of construction. In Canton, a 70-foot turntable of Sellers' pattern is provided, as also workshops and electric plant adequate to the requirements of the railway.

"Work has been started as far as the 160th mile. Three tunnels aggregating to nearly one thousand feet, just a few miles ahead of the railhead, have already been completed. A big bridge at Yingtak, some 90 miles from Canton, consisting of 3-200 ft. spans, 1-60 ft., 1-50 ft. and 1-45 ft. span, is very near its completion. Some of the minor bridges have been finished while others are well under construction. Another big bridge spanning 760 ft. in the 150th mile and a tunnel about 1,000 ft. long in the 160th mile have just been made a start of.

"The northern end of the line has been surveyed and located up to the boundary of Hunan province, but work has not yet been started The line towards that end runs chiefly through mountainous regions where there will be more than sixty tunnels aggregating to over ten thousand feet. It is estimated that this portion alone will require no less than 9,000,000 Mex. dollars to finish, while this, together with the work now in hand, will cost the Ry. Co. something like 16,000,000 Mex. dollars for completion which will take about four years provided facilities are afforded to the working system."

# ACTIVITY OF THE HONOLULU IRON WORKS IN THE FAR EAST

*Formosa.*—During the past five years Honolulu Iron Works Co. have constructed and reconstructed seven cane sugar factories in Formosa, varying in capacity from 650 tons of cane per diem to 2,800 to 3000 tons of cane. Six of these factories are for the Taiwan Seito Kabushiki Kaisha (Formosan Sugar Manufacturing Co. Ltd.) and one for the Meiji Seito Kabushiki Kaisha. The factory for Meiji was shipped in Oct. of this year and has a daily capacity of 1,000 tons of cane.

All of the Taiwan Seito Co.'s factories are equipped with twelve roller mills of the very latest construction and design, having quadruple effect evaporators, central condensers and crystalizers. The buildings are all of steel and built for 150 mills solid pressure per hour. All the factories are operated on the gravity system, the boiling houses being four floors in height so that the liquor is pumped once only to the upper or vacuum pan floor and then drops by gravity from pans to crystalizers, thence to centrifugals without subsequent handling. This is standard type of factory as installed in recent years in the Hawaiian Islands and elsewhere. It eliminates elevators and pumps for handling the products to the greatest extent possible, saving labor and attention.

The bagasse from the mills is delivered direct to furnaces automatically so that the fresh cane and bagasse is not touched by hand.

The largest factory installed in Formosa by Honolulu Iron Works Co. is Ako, with capacity of from 2800 to 3000 tons of cane per diem. A description of this factory will serve for all the others. Ako is equipped with the following machinery:

Two 34″×78″ 12-roller mills with Krajewski crushers, fourteen boilers 7×20 feet, all with automatic bagasse feed, requiring no extra fuel if worked uninterruptedly, six vacuum pans, two quadruple effect Lillie evaporators with an aggregate capacity of 2800 tons of juice, thirty-two crystalizers, thirty-two 40″ centrifugals. This, with the exception of the Guanica central in P. R. and Chaparra—factory in Cuba is probably the largest cane sugar factory in the world.

*Philippine Mindoro Development Co.'s Factory*—Perhaps the most interesting development in the Philippine sugar industry is the plant now in course of erection on Island of Mindoro for the Mindoro Company on what is known as the San José estate. This factory will be fitted most complete in every particular with the latest type of machinery. The buildings are all of heavy steel construction and of sufficient size to accommodate machinery to subsequently handle 1600 tons of cane in 24 hours with one crushing plant.

The plant as at present equipped will have machinery for 1000 tons of cane in 24 hours and will be enlarged as requirements demand. The crushing plant is a 9-roller mill arranged for one additional unit with Krajewski crusher. The rolls of the mill are 36 inches in diameter by 84 inches in length Vacuum pans are of "express" type, each having capacity of twenty tons of dry sugar per strike. Crystalizers are of a capacity to suit the vacuum pans. Centrifugals are 40″ in diameter and are electrically driven. Evaporator, of which there is one in-

stalled at present and space for duplicating same, is of "standard" quadruple type.

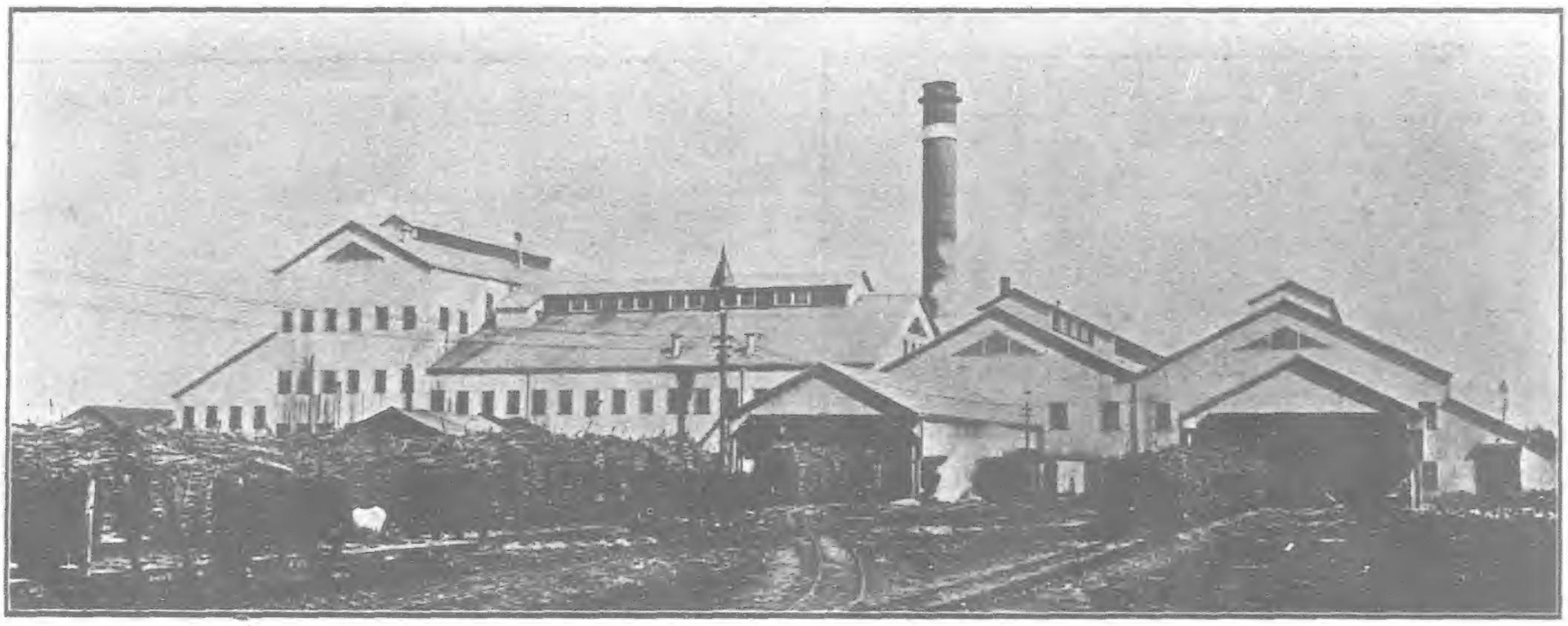
Boilers are seven by twenty feet in diameter of multitubular type.

Condensation system is what is known as the "central" type with the usual equipment and with dry vacuum and water supply pumps.

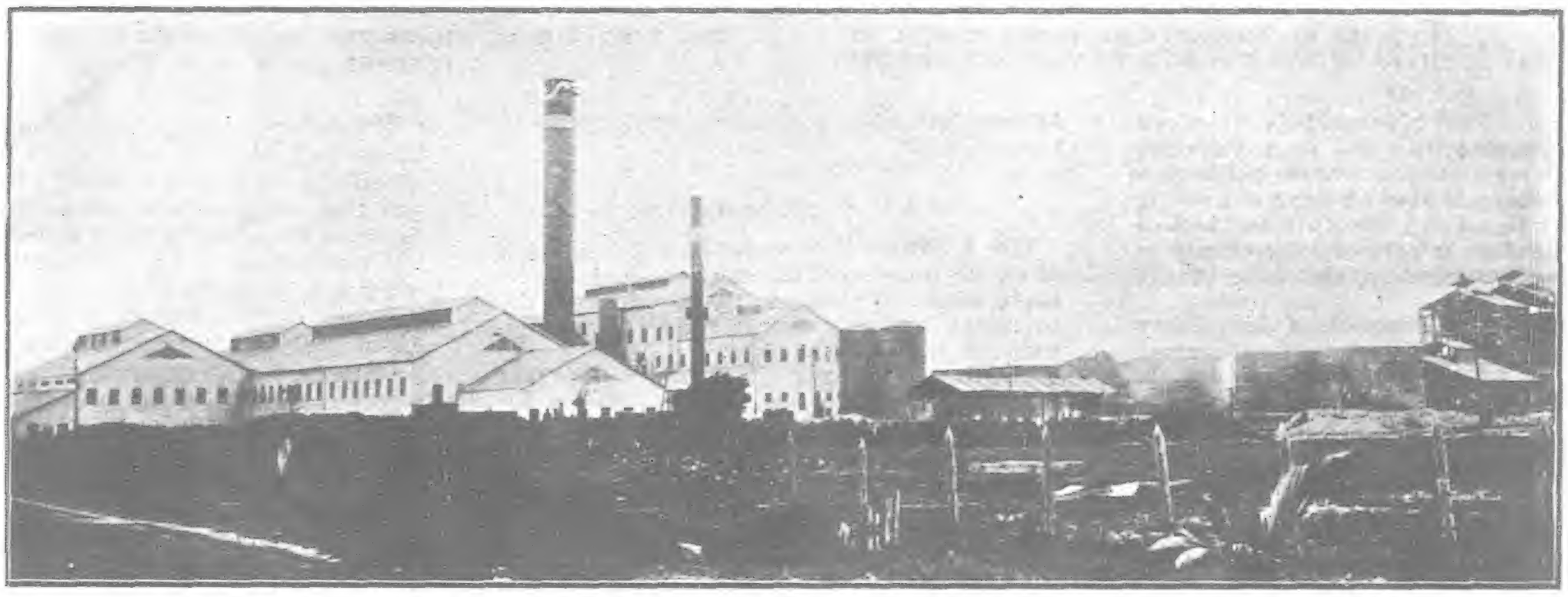
tools for carrying on repair work in their different lines.

The whole of the machinery is now being placed on concrete foundations and piers. Self-supporting stack b ing 9 feet 9" in diameter and 125 feet in height above foundation, about total 150 ft.

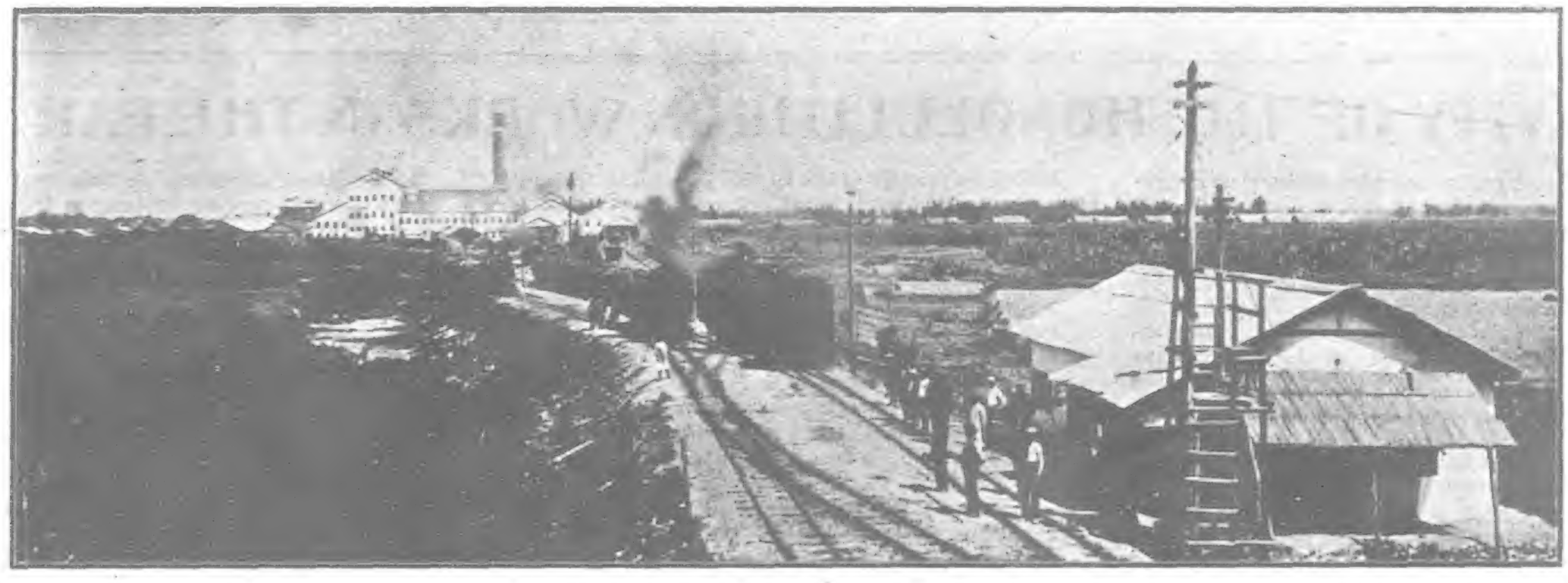
periments conducted by one of the near-by plantations on the island of Oahu, Hawaii, of a new system of clarification. At the present time in all Hawaiian factories, the juice is heated and lime and delivered to settling tanks where it stands a sufficient time so that impurities settle to the bottom. The



AKO MILL OF THE TAIWAN SUGAR COMPANY.—CAPACITY: 3000 TONS OF CANE PER DAY
*Erected by the Honolulu Iron Works at Ako, Formosa, which is standard type of factory installed by this Company.*



REAR VIEW OF THE AKO MILL, SHOWING MOLASSES STORAGE TANKS AND DISTILLERY



ANOTHER VIEW OF THE AKO FACTORY

All auxiliary machinery throughout the factory is electrically driven. Separate buildings housing the power plant, machine shop, carpenter and smith shops. These shops being equipped with all necessary machine

The factory is also filled with necessary machinery for manufacturing white granulated sugar for direct sale to market.

During the past year there have been ex-

clear juice is then drawn off and what is known as the mud is delivered to the filter presses where the clear juice is separated from the mud and scums.

The new process, known as the "Kopke

# KAHN SYSTEM OF REINFORCED CONCRETE IN INDIA

There has recently been introduced into India a new system of reinforced concrete construction which promises to be widely adopted through the increased economy and simplicity which it is possible to obtain with it, says *Indian Resources and Power*. This is the Hy-rib, a new departure of the well-known Kahn system, with which absolutely no centering or wood construction is necessary. With the methods usually adopted in reinforced concrete construction, woodwork has to be built under the steelwork and kept in that position until the concrete has set. The reason for this is that the steel foundations generally used will not hold the liquid concrete; if it were poured on this base without any woodwork underneath, it would simple drop through. A new method has, therefore, been adopted in the construction of the steel framework, so that it will hold the liquid concrete when it is poured straight on it, while a gripping surface is at the same time made underneath to which the plaster for the protection of the steel will adhere.

To architects and contractors the importance of the possibility of abolishing centering will be obviou·. India is a country in which timbe: is usually dear, and though the centering work for reinforced concrete construction is generally put down at Rs. 6 per oo sq. ft., it would probably be found to cost considerably more than double that figure, if the costs were more accurately worked out. But even at the price of Rs. 6 per 100 sq. ft., an invention which obviates entirely the necessity for woodwork must effect an enormous saving in large undertakings. The new steelwork is exactly the same in price as the older pattern, and, therefore, the cost of centering is entirely saved to the contractor b· the use of the Hy-rib. Moreover, it ·enders the expediti·g of construction possible. At present either large sums of money have to be spent on the woodwork or intervals of several days must elapse for the drying of the concrete before the centering for one section can be removed and used in another part of the work.

DEMONSTRATION TEST OF KAHN SYSTEM OF REINFORCED CONCRETE BEFORE LEADING ARCHITECTS AND ENGINEERS IN BOMBAY.

*From "Indian Industries and Power."*

Another special feature of this material is that the ribs lap over one another and clinch, thus making a continuous reinforcement in both directions. The material can be curved to any desired radius and has been used in large quantities in heavy warehouse work. It has been widely adopted in the Argentine Republic, in Brazil, and to smaller extent in Chile; while it has already been generally adopted in the United States and in Great Britain. It is interesting to note, too, that on the occasion of the recent visit of the Duke of Connaught to South Africa, the new material was used in the building of the residence in which His Royal Highness lived.

In order to show the capacity of the new material, a demonstration was given in Bombay recently, a number of the leading engineers and architects of the city attending.

For the purpose of the test two slabs of concrete reinforced only with No. 26 Hy-rib had been made, one 2 inches thick, such as is used in roof construction, and the other 3½ inches thick, as would be used for flooring. Each of these had a span of 5 ft. 3 ins., although the usual builder's centre is only 4 ft. in span, and both were rigoro·sly tested as weight carriers. On the flooring slab, it was calculated that for the area the maximum weight which builders would require it to carry would be 22 cwts., but over 70 cwts. was piled on with practically no deflection and on the roof slab 18 cwts. was finally put on with a similar result.

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clarification system," will consist of a number of revolving centrifugals in which the principle of the cream separator is utilized and the clear juice is drawn continuously from the revolving cylinders while the mud remains in same. About once in every hour these are emptied of the mud, after having the sugar washed out of it. This system dispenses with the settling tanks, *mud-presses, filters*, etc., and will undoubtedly be generally adopted in all Hawaiian factories, as well as all factories erected in the future by Honolulu Iron Works Co. Another process which is now in course of development is what is known as the "Battelle" system for recovering sugar from waste molasses. In the present process of manufacturing cane sugar the waste molasses consists of about ½ sugar and ½ glucose. This sugar in the molasses could not heretofore be exhausted to any greater extent than mentioned above, but with the Battelle process it is estimated that 85 to 90% of the sugar which goes to waste and which amounts to about 6% of all sugar that is made will be recovered. Furthermore, this process will make it possible to manufacture a refined sugar without the bone char process.

Another new system of manufacturing refined sugar has lately come to our notice, the so-called Weise process. The Company formed for the introduction of this process has sent to Hawaii from the mainland some samples of white granulated sugar of the most extraordinary clearness and color of grain, equal to the very best refined sugar. This company claims to be able to manufacture this sugar from 96 polarisation raw sugar at an extremely low cost, producing about 94 of such white refined sugar from 100 raw sugar at 96°.

The Honolulu Iron Works Company are now manufacturing three new mills with a different type of housing; they are made of steel castings, considerably lighter and stronger than the ordinary C. I. housing so far used. The King bolts only come part of the way into the cheeks, where they are firmly secured, thereby allowing the lower rolls to be placed as close together as the strength of the returner bar will allow, reducing the friction, and consequently the power, for driving the mill to the greatest possible extent. The hydraulics are placed under the top caps in such a manner that they allow free motion of the top roll and can be very readily removed for the renewal of packings.

# THE MINERAL RESOURCES OF THE PHILIPPINES

The Division of Geology and Mines of the Philippine Bureau of Science has issued an interesting bulletin comprising a review of the progress of the mining industry for the year ended June 30, 1911. The brochure is highly illustrated and contains exhaustive papers from Warren D. Smith, Ph. D., geologist and Chief of the Division, Frank T. Eddingfield, E. M., mining engineer, Wallace E. Platt, A. M., geologist, Paul R. Fanning, S. B., Metallurgist, and Frank A. Dalburg, B. S., Coal Engineer, all of the Division of Mines, as well as a paper by R. Y. Hanlon.

Comparative tables of the mineral production for the last four years and prepared by Mr. Eddingfield, show a falling off particularly in the production of gold, although in a measure this was true of all mineral products. The tables follow:

TABLE I.—*Mineral Production in 1910.*
[In pesos a Philippine currency.]

| *Province* | *Gold* | *Iron* | *Coal.* |
|---|---|---|---|
| Albay | | | 172,955 |
| Ambos Camarines | 144,900 | | |
| Bulacan | | 20,023 | |
| Cebu | | | 3,300 |
| Ilocos Sur | (*d*)1,000 | | |
| Masbate | (*e*) | | |
| Mindanao | *d*40,000 | | |
| Mountain Province | *d*95,960 | | |
| Nueva Ecija | *d*25,000 | | |
| Pangasinan | *d*2,000 | | |
| Total | 308,860 | 20,023 | *g*176,255 |
| Total metallic with coal | | | 505,138 |
| Total nonmetallic | | | 1,541,031 |
| General total | | | 2,046,169 |

TABLE II.—*Comparative Statement of Mineral Production in* 1907, 1908, 1909, *and* 1910
[In pesos a Philippine currency.]

| Year. | Gold. | Silver. | Copper. | Iron. | Manganese. | Coal. | Non-metallic. |
|---|---|---|---|---|---|---|---|
| 1907 | 141,194.00 | 95.53 | | | | 26,799.00 | |
| 1908 | 434,500.00 | 2,750.00 | 52.00 | 17,500.00 | | 77,166.00 | 815,918.00 |
| 1909 | 495,194.00 | | | 31,078.00 | 12,500.00 | 197,184 00 | 1,504,091.00 |
| 1910 | 308,860.00 | | | 20,023.00 | | 176,255.00 | 1,541,031.00 |

*a* One peso Philippine currency is equal to 50 cents United States currency.
*b* Some silver generally found alloyed with Philippine gold. None is mined separately.
*c* No manganese reported for 1909, but several new deposits were found.
*d* Includes estimated amounts produced by natives
*e* No mills running.
*f* Small amounts smelted by Igorots.

THE HEADWATERS MILL IN BAGUIO DISTRICT

In a short introduction Mr. Eddingfield gives a short review of conditions during the year. He says:

"The year 1910 has been characterized by the greatest activity in the history of mining in the Philippines, yet the production of gold fell to but little more than 60 per cent of the previous year, and all the other mine products suffered a reduction. The reasons are given below:

"The year 1909 closed with a damaging flood in Benguet which tore away the entire cyanide plant of the Consolidated Mine and greatly delayed the Bua, since when the mines have been worked but very little. Later, severe storms swept through the south, causing considerable damage to the San Mauricio and hindering the work of construction in Masbate. Still later the Philippines and Stanley dredges stopped work and the old Paracale dredge sank. Then the San Mauricio, the Mine most anxiously watched by everyone, suspended operations and discouraging reports came from the Tumbaga.

"Such an array of calamities would have been enough to dishearten a much more advanced country than this, but they affected the con-

*(Continued to page 225)*

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Additional tests took place on January 27th, before the same gathering of engineers and architects. The 3½" slab of 5'-3", reinforced by No. 26 Hy-Rib, was loaded to 2 cwts. per square foot and then a cotton bale weighing 4 cwts. was hoisted to a height of 6' o" and dropped, this tremendous impact resulting in the cracking of the underside of the slab, and producing a slight deflection, but it did not impair the integrity of the slab as was clearly shown by subsequently loading the slab with 132 cwts., or a uniform load of 7.¾ cwts. per square foot.

The slab showing no sign of collapse under this excessive load and only a small additional deflection, which was very gradual and uniform, and the supply of pig-iron being exhausted, it was decided to again hoist the cotton bale and drop it. This time it was hoisted to a height of 8'-o" above the pig-iron and dropped, but with no noticeable effect on the slab whatever.

The other slab, 2" thick 5'-3" span, which is the construction recommended for construction, was loaded with 30 cwts. or equivalent to 4½ cwts. per square foot, and this induced a deflection of approximately ⅝, but there was no sign of failure as the increase in deflection was gradual and uniform, case when approaching failure.

The success of these tests would point to a large adoption of this material throughout India. We believe that it will specially commend itself to engineers in country districts on account of the large saving in labor and centering, and on account of its adaptability for walls, partitions, tanks, etc. We understand the material comes in sheets of 4, 9, 8, 10, 12 feet, and the Company also manufacture a small hand-cutter for cutting the material for the job as required.

Another advantage is that the material can be curved to any radius and will commend itself for use in pipes, tanks, arched floors, etc.

The accompanying photograph shows the slab at completion of the test. The material is manufactured by the Trussed Concrete Steel Company of Detroit, Michigan, who manufacture the well known Kahn Bar and other products. Messrs. McKenzie's Saw Mill, Limited, have been appointed Sole Agents for Western and North-West India.

# THE FAR EASTERN REVIEW

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MANILA, SHANGHAI, AND YOKOHAMA, DECEMBER, 1911


## CONTENTS



# THE VIOLATION OF THE OPEN DOOR BY CHINA

*(Communicated)*

Dear Mr. Editor:

I have read with great interest your article on "The Violation of the Open Door by China." Being a Chinaman, I, of course, look at the situation from a standpoint of absolute neutrality as to British, German, American or other interests.

Before entering upon my argument I would just like to point out that your reasons why American manufacturers have been unsuccessful in this country are not the correct ones. The little business they have lost owing to unfair decisions is negligible.

Some little time ago I listened to an argument between an American and an English friend regarding the relative sportsmanship of their respective countries. After a heated argument in which the American stated that the English, instead of taking their defeats like men, were always trying to find excuses, such as losing the polo international because they had not enough ponies, the yacht race because the Americans made such impossible rules, the intervarsity sports because the Americans trained their men specially, whereas the English were all amateurs and went in to the thing for sport, and ended by stating that, after all, the organization that won was the best, and if the English were true sports, instead of spending their time explaining how they lost, they should change their methods and make sure of winning next time. I think the position of the English in sport—according to my American friend—is the position of the American in business out here, and the advice of my American friend to English sportsmen might well be taken to heart by American manufacturers. In the following argument I will agree with you that the present methods are unfair, but would point out that American manufacturers are not the sole sufferers.

The unfair discrimination is against every manufacturer not of the nationality of the financing body, and even against manufacturers of the same nationality who are not on the approved lists. I believe this was also true in the case of the American Development Co. at Canton, and it certainly may be expected while conditions exist unchanged.

Every engineer believes that the machinery he is familiar with, is the best, so, within certain limits, it pays to buy what your staff wants rather than material they are prejudiced against. It is natural for a British engineer to prefer British machinery and a German engineer, German engines. A British engineer in buying a British engine gets something he knows the virtues and limitations, but if forced to take an American engine, he secures something he knows of only through the pages of his technical papers, and will always be expecting the boiler to leak because many years ago some railway had one that did. Faults that happen in an English locomotive are taken as a matter of course, but if they happen in the American locomotive are made the subject matter of a long report to the director, with a strong strain of "I told you so" running through it.

This feeling can easily be seen in the letter quoted by you.

"The lowest tenders are from American and Continental makers for their specifications and patterns. There is, however, very little difference between the lowest tenders and those of really first class makers".

The really first class makers, as pointed out by the letter, are British. Evidently the impression meant to be conveyed by the letter was that American and Continental makers are second class. This is, of course, absurd, and is like the statement of the old Chinese historiographer who described China as the centre of the earth, and all other countries as tributaries and barbarians, and I believe has as much reason.

To this day American locomotives are hauling the most important trains on the I. C. R. The engineers of that railway have never been able to say anything against American locomotives excepting that their tubes leaked at first, but agree that after overhauling they were as good locomotives as they had on the line.

All locos. have their faults, and if the American boilers give more initial trouble than others, the American valves are as good today as when they came out, while the European ones have to be continually overhauled. The American boiler faults are blazoned far and wide, while other defects are quietly accepted as necessary and usual.

All this, however, is merely beating the air, for as long as the engineers of the various railways are allowed to run things according to their own particular likes and dislikes, the Chinese will never get fair play. We can not get it from the engineers out here because it is quite evident that their experience has been limited to a very restricted circle of manufacturers and districts.

The only person who can insist upon fair play is, as you say, the managing director. You have blamed these gentlemen very much, but what can they do? Many of them do not know a tank engine from a Mogul, and they must rely on their engineers. Supposing one of them, director of an English loan built line, put his foot down and insisted upon the cheapest loco being bought—which, let us say, was of German make, the English engineer would immediately send in a list of dire prophecies of accidents, breakdowns, etc., till the poor director would think he had ruined the whole line. Supposing, however, he was firm, and did buy the German loco. From the day of its arrival it would be reported. The brakes would be stiff necessitating an extra man merely to work them, the valves would leak or something else would happen. All these things, which might happen in any loco, in the case of an English loco would be taken as a matter of course, but, in the German loco, would serve to so worry the director that next time he would follow the engineer's advice. The director can not do anything else. He might insist upon the German engine being run as well as the English engine, or else ask the locomotive super to resign, but this would probably be disapproved of by his Peking superiors under protest from the legation of the country furnishing the loan.

The only man who ever attempted to put his foot down was Mr. Loh, the former director of the Tsinpu railway, and we all know what happened. Instead of upholding him in his fight for a square deal, the railway board discharged him. That the board did not think him in the wrong but merely discharged him as the easiest thing to do, is shown by his immediate appointment as engineer-in-chief of the Yunnan railway. Do you think, however, that this dismissal will stiffen the backbones of other directors? As soon as friction arises between a director and his engineer, the engineer is sure of his government's support in having the director dismissed. The engineers know this and so do the directors. The Yuchuanpu (Railway Board) don't want to be bothered, as it distracts the attention of its officials from other profitable business and find it easier to dismiss an honest director rather than have the worry of backing him up.

Under present conditions it is absolutely certain that the great preponderance of orders from any railway will go to the country—or should I say company—financing it.

Even if the Yuchuanpu insist upon indents being put to public tender, it can easily be worked to benefit favored interests. After a great deal of trumpet blowing the directors of our Pehan railway announced that all material would be put to public tender, and semi-public tenders are being regularly called, but I defy any one, excepting those in the know, to quote to them. The specification is made up in French somewhat as follows.

| | | | |
|---|---|---|---|
| Injecteurs | 137 | F. 35 | 2 pieces |
| Unions | 21 | J. 8 | 1 |

The marks and letters probably refer to some number on their stock book, which no one can see, and the marks of the last invoice. There is only one way to find out and that is by a visit to the stores some three hours ride from Peking, and securing permission (which is more than likely to be refused) to go over the store and hunt for the articles required. You can imagine the amount of work needed to quote on one union worth say 50 cents. The

only people who can quote are the original suppliers. Such public tenders are all rot. I consider a man much more honest who, like the Germans on the North Tsinpu railway, openly tell everybody they might as well save themselves the trouble of tendering, as they have already settled who is to get the business.

As long as each railway is allowed to settle its own standards according to the limited experience and partiality of the men in charge, so long will China find it impossible to secure a square deal. Every country in the world has suffered from lack of standardization, and China might have been expected to profit by others' errors, but instead she seems to have those multiplied by the number of countries financing her. One despairs of our government ever doing anything in a sensible manner, as the Peking officials only care about feathering their own nests.

It is certain that a radical alteration in the methods of railway administration is needed. Many foreigners with whom I have discussed the matter, however, say that the rock on which all Chinese efforts will be wrecked is that of "Squeeze." Without doubt that has been the great blot on all former administrations.

Although bribery and corruption has been sanctioned by usage, the great mass of opinion has been strong against th · system, and now that the revolution has opened up a new era and made certain a constitutional government, I should not wonder but that squeeze and bribery will be made as great an offence in China as in England under the Illicit Commissions Act. Where adequate salaries have been paid as on the Kalgan and Szechuan railways, I defy anyone to say that they have ever paid a cent in b ibes to the engineers or directors. This proves that our great fault does not arise from inherent dishonesty, but because inadequate salaries make it imperative.

If fair salaries are paid, squeezing can be made as rare as in foreign countries. A great fight will be necessary to eradicate this evil, but our nation has the moral stamina to do it, as is shown by the way in which we have stopped the growth of opium, and if you will only try to imagine the impossibility you would have in trying to abolish the drink curse in your own countries, you will admit that China has still hope.

As I said before a radical alteration in the methods of railway administration is needed. Even the old administration saw this, and as far as I can find out did call a conference of railroad men in order to decide upon some sort of standardization. So far so good. Any one who knows the medley of designs existing at present will agree that some sort of standardization is necessary. But as usual the Peking board went the wrong way about it. What officials were they calling to Peking? The great preponderance would be British; there would be no American, one German, and perhaps a couple of Frenchmen. What were these people to do? To make standards for the Empire? If so then, of course, the standard would be an English one. That is not the way to establish a set of standards. To be any good they must be drawn up impartially so that manufacturers in any part of the world could quote on them with a fighting chance of success. The Engineers at present in China are not likely to decide fairly. Few of them seem to have had any experience outside their own country, and they all seem to think that only their own country's manufacturers can produce anything good. This denotes limited experience. Furthermore, may I say it without in any way aspersing these gentlemen, all have their future to protect. Although servants of China, they always keep one eye on the loan syndicates. Personal advancement and future positions must influence their decisions. They are not unprejudiced as is shown by your article.

Now the railways of China are important enough to obtain men whose experi nce and reputations are big enough to place them above the pettiness of seeing nothing good excepting in their own country's machinery, and of seeking to pull the chestnuts out of the fire for friendly manufacturers.

Our government should therefore appoint a commission composed of a well known engineer or engineers, from each one of the loan countries. The commission could be presided over by H. E. Jeme Tien Yew, as you suggest, and should also include one or two other Chinese engineers of standing and carry out its duties in the manner of a Royal Co mission in England, or a Senatorial Committee in the States. It should have power to call as witnesses any railway man in the Empire.

Such a Commission would cost a great deal of money, but when its duties were completed China would have definite lines laid down which it could work along towards standardization with the probability that immense sums would be saved yearly.

Such a commission, actuated solely by a desire to devise the best and most suitable standards, might be trusted to act fairly as its interest in China would be finished with its work.

The duties of the commission would be to produce a set of limiting standards or specifications, within which every railway in China could call tenders with the c rtainty of getting good results, and within which they should be compelled to work. It is impossible for standards to be devised to the satisfaction of everybody, but they should be the best for China without thought as to whom they would favor. Some such set of specifications is absolutely necessary if China wants to buy cheaply. At present, when every official is allowed to act upon his own ideas, it is impossible to get cheap prices. As long as one locomotive is bought on one specification, and another on a totally different one, it would not pay any manufacturer to make pr parations for the business. But if every railway in China had to purchase material on a standard specification, and honestly award the order to the lowest tenderer, manufacturers would prepare for the business and China would benefit by cheaper prices.

It is difficult for me to say within what limits the commission could work, but without doubt they could formulate a set of limiting specifications which, while they gave a fair chance to all manufacturers, would make it certain that only good results would be obtained.

For instance, in the case of bridges, they might specify the unit stresses to be used in designing, loading, type and general features, materials and workmanship and inspection and testing, in the same way as outlined in the specification as drawn up by the American Railway Engineering & Maintenance of Way Association. Such a specification, while making certain a first class article, does not favor any one manufacturer over another.

The remainder of the details could be safely left to the builders. English engineers have a habit of asking people to quote to drawings which minutely specify the dimensions of all T's and channels in English standard sections, and as the Continental and American sections are slightly different, the latter are debarred from competing. Another point which could be waived is the difference in the shop practices of the various countries. In England the rivet holes are drilled, in America punched and reamed. The English state that punching distorts and consequently damages the surrounding material. The Americans, while admitting that drilling is slightly better rivet for rivet, contend that when a punched hole is reamed out, it is as good as the drilled hole, and owing to the lower unit stresses they use on rivets they state that their joints are superior to the English. The real reason why Americans punch their holes instead of drilling is because of the less amount of labor needed. In any case, whatever the difference, it must be admitted that it is so small as to be negligible, and certainly not important enough to make drilled holes insisted upon, considering that they handicap the Americans by about 5%, and other things being equal, this 5% would pay for the purchasing commission which has to be paid to the loan syndicate.

Without doubt a fair set of specifications could be devised, but even they would be evaded if left to the engineers of the various railways to adjudicate upon.

The only way to fair play is to take the buying out of the hands of all who can influence the giving of the order, and make it automatically sure that everybody has a fair chance, s that the lowest tenderer, provided he is a firs class manufacturer, will secure the business.

Instead of allowing the engineers or othe interested parties to specify whatever they thought fit, a buying department, independen of either the railway staff or the loan syndicate etc , should be formed.

All requisitions for material should be sent in to this office, and tenders invited following the official standards produced by the commission, and the lowest tender accepted irrespective of nationality. To see that the material was up to standard our government should retain inspecting engineers of good standing (say the gentlemen who had sat on the standardizing commission) to inspect the materials at the factories in countries likely to submit tenders. It is not fair to appoint only one in London who has to inspect all material whether manufactured on the continent or America, for his additional charges often seriously militate against materials from those countries being accepted, and from the advice of one of them at least they do not seem to be able to judge material of other countries impartially.

Many engineers order from an approved list of manufacturers. The necessity of such a list would indicate that engineers are not sure of what they want. For instance, if I wanted to buy springs, and knew just what I wanted, I could safely buy as per the cheapest offer. But if I did not know what kind of spring I wanted, and couldn't tell if a spring delivered was what I wanted or not, I must go to one of the best known manufacturers in order to safeguard myself against my own ignorance. This is one good reason for the approved list system.

As soon as China has a set of definite standard specifications, an approved list will be unnecessa y, as China will then know what she wants and it will be up to her Inspecting Engineers to see that she gets it.

The arrangement with their London agents has been always defended by the L. C. R. officials, because these agents were supplied with a complete set of blue prints and code words for everything used by the railway, making it so easy to order from them, and too much trouble to explain to other people. These officials ignore the fact that all the blue prints, code words and specifications could be produced for 50 other firms at a very slight cost. For a few hundred taels they could place everybody in a position to quote, saving the government tens of thousands of taels.

It would seem that residence in China has a bad effect on everybody. A foreigner in his own home country would consider he was negligent or dishonest in his duty unless he secured the best material at the cheapest price for his employers. In his home country the engineer will give, as on the Brighton railway, the contract for its conversion to Germany, Soudan bridges to America, equip German arsenals with American machinery, and buy Panama dredgers from the Clyde, but in China he seems to see nothing good but in his own country. Is this due to the bad effect China has on foreigners, or to the fact that the experience of the engineers we get has been very limited and confined to the little centers in which they were trained? In any case I suppose they reason, "Oh, well, the Chinese don't know any better and have to pay for what we decide." Is this honest? I think not, just because we trust them they should be more honest with us than they would be at home, where they deal with people who know more than they do. Especially should they keep a clean slate in China, where they are on public trial with men of other nationalities, and where they should give effect to the promises of their various governments to concede a square deal to all.

If, however, an approved list is absolutely necessary, instead of permitting any partial person to draw it up, let us take the lists already approved by each of the foreign governments. In England you have the Colonial and India offices who have approved lists, Germany has its railway administration, and France the same. In America there is the Master Car Builders Association or some of the big corporations. What is good enough for these organizations is surely

good enough for China, for the men who drew them up surely know what they are doing as well as any of the engineers in China. Personal friendship and prejudice should not be allowed to influence any approved list.

An arrangement such as the above would make the awarding of contracts as fair as is humanly possible. The limiting specifications, without restricting the competition to a favored few, would make certain that the material did not vary outside of well defined limits. The independent buying office would have nothing to do, but issue and receive tenders. It can not, for value received, favor any manufacturer, because the lowest tenderer, accepting the necessary guarantees must get the order. To see that the workmanship, design, etc., were all as per standard wanted, we would have the inspecting engineers, and so that undue discrimination would not be shown against the products of the different countries, there will be a different consultant for each country. Such an arrangement, if seriously and fairly insisted upon and carried out, promises fair treatment to all.

Another point that should be taken up by the government is the training of Chinese engineers, for in future we hope to build and run our own railways as Japan has done. At present f reign engineers pooh pooh the idea of Chinese engineers ever becoming competent. But if they will only look around China they will see many evidences of works carried out by Chinese engineers in the olden time which attest a much greater engineering skill than any shown by foreign engineers in this country hitherto. But although foreign engineers have not shown any great ability yet, we do not jump to the conclusion that they couldn't if occasion arose, and they should remember that it is just as possible that Chinese engineers might also make good if they were given the chance, as they have done on the Kalgan railway. Much adverse criticism has been directed against this railway, but taking it all in all it is as good as any in China, and cost for cost is cheaper. I have no doubt that it is not finished as finely as say the Nanking railway is, but as a well known American engineer once said, "Engineering ability is shown in making one dollar go as far as another man would make two, and not to spend four dollars, where one dollar would have done." If you could compare the costs of similar articles on the books of the I. C. R. and the Kalgan railway as I have done at the archives at Peking you will find that the Kalgan costs are at least 5% cheaper than the I. C. R's, and that not for inferior material, but material of the same quality, and very often from the same manufacturer. The only failure on the whole line is for material compelled to be purchased from the approved list of the I. C. R. It appears to be only common sense to purchase a special article from a manufacturer who had previously turned out a similar article, but common sense and an approved list do not seem to run together, so the order was placed with an untried maker of the approved list with failure as the result.

In order to create a force of skilled Chinese engineers, instead of employing as many engineers as the I. C. R. does (who have more engineers than the Midland railway in England), three-fourths of the foreign staff should be dismissed and Chinese appointed in their place, and instead of having engineers bored to death with nothing to do every 50 miles, Chinese engineers might be appointed every 50 miles with a foreign engineer to supervise say every 200 miles.

It would also save exorbitant charges if the chief engineer had in his office a Chinese assistant engineer to take charge of the earthworks and other Chinese work, for it is notorious that the interpreters of the foreign engineer cheat them right and left. I remember a case in which a district engineer grew suspic ous of the labor returns from a certain work, and decided to pay a surprise visit to the job. He confidentially informed his interpreter of his intention telling him to keep it a secret. The interpreter, who was receiving half the squeeze, immediately informed the contractor, and when the engineer arrived the requisite number of men were of course on the spot. Foreigners may say, however, that the Chinese engineers will probably be as great squeezers as the interpreters, but provided they are paid fair wages they can be strictly honest as is shown by the records of the Kalgan and Szechuan railways.

It appears to me that if there is the will there is the way to alter the present unsatisfactory conditions, and let us hope that under the new régime there will be the will. If Peking really desires to change things she must get advisers who know their business, and not men whose only qualifications are "olo friend pidgin" or toadyism. The old position was one of the blind leading the blind. Each official seems to be making as much as he can out of his position trusting to luck that China will last till he has made enough.

The foreign powers, instead of trying to lift China out of the mire, are apparently each working for their own benefit. Admitted that our officials are as corrupt as foreigners say they are, would it not be better for the foreign powers to combine for assisting China along the path to prosperity rather than along the path to her destruction? Foreigners complain that our officials are too vacillating and are always playing one country off against another. How is that possible unless the foreign powers are each trying to cheat each other and are willing to be played off one against the other? China is big enough and rich enough if properly developed to provide a market for the surplus products of the manufacturing nations for many years, and the more prosperous she becomes the more she will buy.

In olden times the progress of one country was taken as a menace by another country, but nowadays surely every schoolboy knows that the prosperity of one country is bound to react favorably on the prosperity of all the others. All professors of political economy teach this as a maxim, why is it then not acted upon, or is it accepted as being as much an academic proposition as your great commandment "Do unto others as you would that they should do unto you"?

F. K. P.

## THE ADAPTABILITY OF PHILIPPINE LABOR FOR ENGINEERING CONSTRUCTION

The adaptability of the Filipino labor in carrying out extensive undertakings is made the subject of an interesting report by the Director of Public Works to the Secretary of Commerce and Police of the Philippine Islands. It is a comprehensive review of the success of the Bureau in developing a reliable corps of laborers in its different divisions of activity and the data furnished should prove of great value in the consideration of engineering construction by private capital in the islands. Through the courtesy of the Secretary of Commerce and Police, we are enabled to reproduce this data in full as follows:

*Labor Employed:*—During the fiscal year ending June 30, 1911, from 13,000 to 19,000 laborers have been continuously employed on public works under the supervision of this Bureau.

The average has been 16,157 laborers for each working day, classified as follows:

| | |
|---|---|
| Roads | 10,300 |
| Buildings | 1,887 |
| Bridges and culverts | 1,630 |
| Irrigation | 1,026 |
| Teamsters | 591 |
| Miscellaneous | 487 |
| Artesian Wells | 236 |
| Total | 16,157 |

*Wages:*—The wage paid for unskilled labor ranges from 30 to 80 centavos per day, varying with locality. Where labor is plentiful and cost of living low, rates are low. With reverse conditions, rates are correspondingly high. For the last year the average daily rate of pay was ₱0.581.

*Efficiency:*—Due to lack of nourishing food, ignorance of the laws of correct living, and the effects of tropical climate and tropical diseases, the Filipino is, generally speaking, physically weak. In stature he does not equal the average American or European laborer. In addition to the above handicap he is usually untrained even in the use of tools so simple as pick and shovel. His wants are few, therefore he has no incentive for continuous hard labor. He does not work with the intention of making a steady livelihood, but merely to earn a few pesos to satisfy some immediate present need or whim. Under these conditions the untrained laborer is in many cases not worth even the small wages he receives; on the other hand, the Filipino laborer responds quickly to opportunity, is susceptible to training, and by patience and fair dealing may be developed into an efficient worker.

Contrary to prevailing opinion, the best workmen are not confined to any particular class, locality or tribe such as Ilocano, Bicol, Tagalog, Visayan, etc., but are largely the result of environments. The laborers in the vicinity of commercial centers and in thickly populated districts have from necessity as well as opportunity acquired habits of more or less continuous industry. In nearly all localities where opportunity has presented itself, common laborers have learned to efficiently use saws, axes, stone drills, picks, shovels, scrapers, and other ordinary implements in a satisfactory manner.

By selection it is possible to develop laborers of a higher type who are quite capable operating machinery of such as stationary engines and boilers, road rollers, and automobiles, and who make excellent carpenters, stone masons, blacksmiths, etc.

The greatest need of the Filipino laborer is training. Without it he is an inefficient and unprofitable worker. With training and selection he becomes not only efficient but reliable and trustworthy. It is believed that the efficiency of the Filipino laborer will increase in proportion as his own wants increase. With the desire to own better homes, dress better and eat better food he will work harder, more continuously and more intelligently.

In dealing with Filipino labor three things appear to be essential:

1. Competent foremen and overseers who thoroughly understand their business and who are just in their dealings with the laborers and tre t them with courteous consideration without bluster, and who will at the same time tolerate no imposition.

It is absolutely essential that the foreman fulfil strictly all promises made and never indulge in idle threats. Filipinos as a whole have no respect for any one who does not keep a promise made or who fails to inflict a penalty threatened.

2. Laborers should be properly housed, fed, and provided with wholesome recreation.

3. Filipinos should be paid promptly every Saturday night in time to permit them to return to their homes for Sunday.

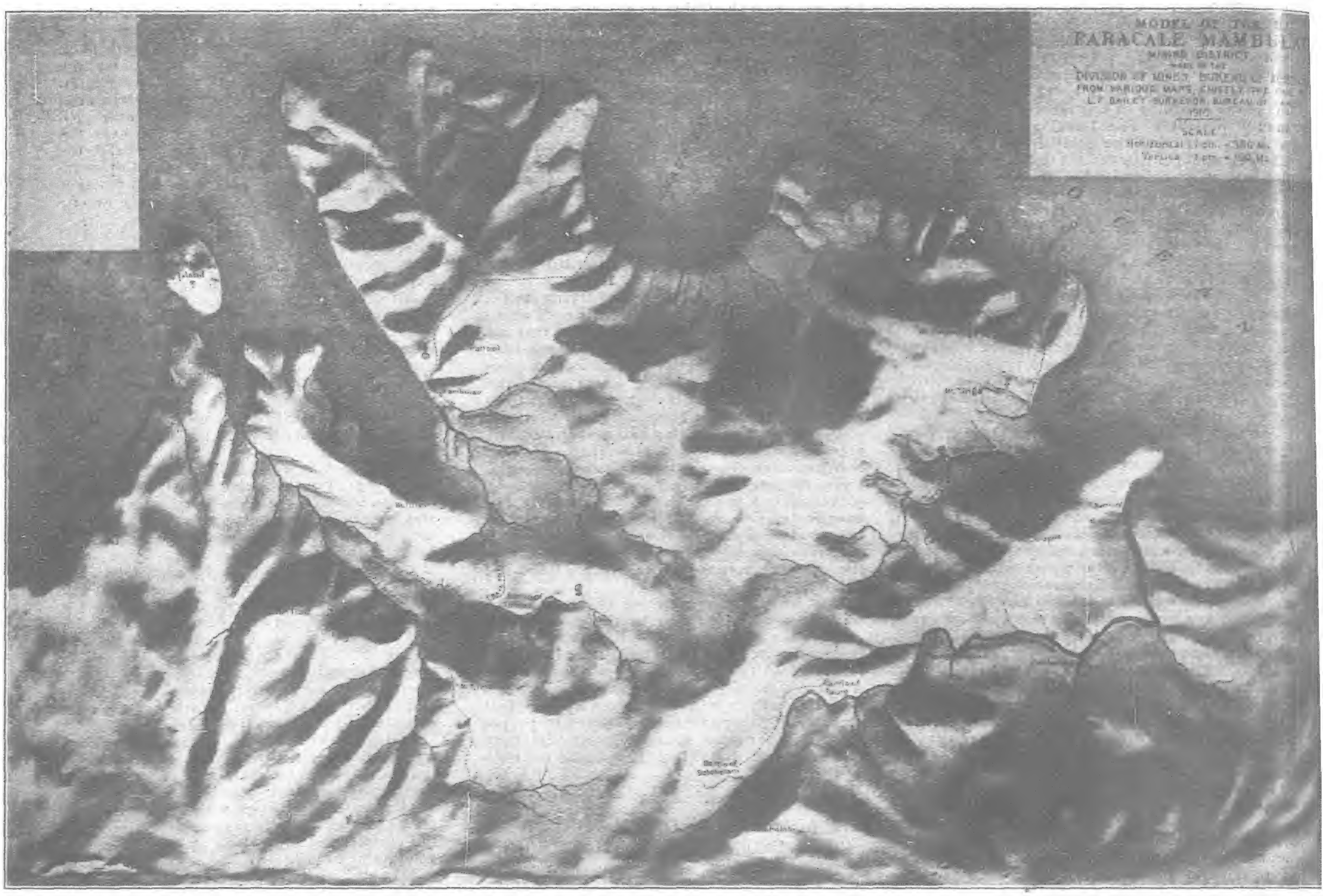
The failure to pay promptly, the requirements of overtime and holiday work, and the rough and unsympathetic character of the men put over them, have in many cases been responsible for the failure to obtain results from Filipino labor. When well fed and cared for and under firm, competent and kindly foreman, the laborer is capable of giving good, and sometimes excellent, results.

## THE CHINESE REVOLUTION

The recapture of Hankow by the Imperial forces together with the surrender of Nanking to the Revolutionaries were the principal evidences of activity in the field during the month. Negotiations between Yuan Shih Kai and General Li Hung Hang looking to a compromise, so far, seem to have lacked progress, although hope is still held out that some basis of understanding upon which all forces for reform could agree might be reached at an early date.

The retirement of the Prince Regent and the appointment of Yuan Shih Kai practically as Administrator for the Imperial House were the most significant reports from Peking.

Conflicting advices are being received daily from the different provinces that have declared their independence, but evidence of a widespread demand for reform is unmistakable. We have knowledge of no element in China that desires a continuance of the old order, save a very small remnant of Manchus entirely de-




pendent upon Imperial favor. In the Manchu provinces, since the revolution began, the sentiement there appears very strongly in favor of reform yet differing from the south in that the former prefer the retention of the monarchy in form while the active leaders in the South demand the complete uprooting of the dynasty and the establishment of republican form of government. Excluding the question of form of government there does not seem to be any serious differences to adjust if we accept as sincere the promises of Yuan Shih Kai, and are not misled as to the wishes of General Li.

General Li declares that his followers will be satisfied with nothing but a republic. He expresses distrust of Yuan Shih Kai and his promises declaring that once the revolutionary leaders entered into a compromise and disband their forces, the Imperialists would break every promise made. He even hints that the reactionaries would discredit Yuan Shih Kai, once peace was restored, and reform would be as far away as ever. If General Li were assured by substantial guarantees that the spirit of the pledges, made by Peking would be fulfilled, there might be hope of an early adjustment. The Revolutionary leaders feel that they are safer under arms than they would be if they accepted the overtures made and disbanded their forces. They distrust Peking and there is every indication that Peking is doubtful of the good intentions of the republican forces. At the present writing peace negotiations are in progress. The outcome remains doubtful, although the leaders on both sides seem prepared to discuss the situation dispassionately, and in the end may agree to sacrifice personal ambition and prejudice in the general interests of the Chinese people.

Yuan Shih Kai urges that unless the form of the monarchy be retained, the empire will be divided against itself and be exposed to disintegration. He opposes a republican form of government as not adaptable to the great mass of the Chinese people, while liberal constitutional government in the form of a limited monarchy would secure as great a measure of reform as a republic and at the same time preserve the integrity of the empire.

General Li expresses his lack of faith in the sincerity of purpose of the Imperialists, and urges that the Chinese need never hope for reform under the Manchu dynasty. He declares the only hope for the Chinese is the complete overthrow of the dynasty and the inauguration of an entirely new era under the banner of a republic.

Racial prejudice seems to have entered largely into the controversy and has more or less retarded dispassionate discussion. The elimination of the Manchu, even from participation on equal footing with the Chinese in the proposed republic, is advanced by the more radical among the revolutionaries and indicates how deeply rooted is the distrust of Imperial purpose among a large number of the leaders. Even the pronounced yet less radical attitude among the Manchu reformers, who have submitted petitions to Peking but who favor the limited monarchy, is interpreted by the Chinese as an evidence of Manchu craftiness.

It would seem therefore that the greatest obstacle to an adjustment is lack of confidence. We believe, if the Imperial and Revolutionary delegates respectively were assured that the terms upon which the two parties might agree would be carried out in the spirit as well as in the letter, the struggle now on would soon terminate. How is this confidence to be established and the actual carrying out of measures agreed upon guaranteed? That seems to be the problem awaiting solution.

Notwithstanding the present disturbed condition in China and the serious conflict of opinion, faith in the capacity of the Chinese people to solve their own problems is general. Their splendid showing in the suppression of opium of a measure of co-operation along lines of reform has no parallel in western history. The reform of the present system of tribute so as to eliminate "squeeze" by the substitution of equitable taxation to provide revenue, provision for a civil list consistent with the needs of the administration, and a real budget that reflected the wishes of the country, are the pressing needs of the hour. Once these reforms are realized, those familiar with the capacity of the Chinese in all departments of industrial activity predict the greatest measure of progress in the development of the country and consequent content and prosperity of the Chinese people whether under a republic or a liberal limited monarchy.

So far as can be learned there is no disposition on the part of the powers to intervene, rather, indeed, a well defined understanding, appears to have been reached to keep "hands off" and let the Chinese settle their own differences and put their house in order. The protection accorded foreign interests by General Li and the absence of outrages by his army have won a large measure of confidence and sympathy from abroad. The fear that the disturbed conditions would entail the spread of anti-foreign fanaticism has been dispelled to large extent as the revolution progresses.

BAGUIO RELIEF MAP

The effect of the revolution upon trade has been more or less indirectly felt in Shanghai, especially with reference to the Yangtsze valley. Shipments up the Yangtsze have been suspended and the advances to finance this movement were not realized, thus locking up large sums in the native banks. Then followed a run on the banks for a few days when payments were suspended and Chinese dealers having deposits found their money tied up. Before suspension there were a large number of native bank orders out which the banks refused to cash causing much embarrasment until arrangement were made to take them up. This relieved the situation somewhat, but the general stringency made it inconvenient for many dealers to take delivery of goods.

The peace goods guild petitioned the foreign merchants to cable the mills to stop shipments on the way and cancel all orders in the looms owing to the impossibility of taking delivery on account of the revolution. It is not improbable that this attitude on the part of the guild was encouraged in some measure by the drop in prices in Manchester as well as by the losses threatened through disturbed conditions.

Confidence in a marked increase of trade following the reforms inaugurated as an outcome of the revolution prevails among foreign firms. There is a feeling that whatever immediate losses are sustained, with a rejuvenated China, these will be more than recouped by increased trade following the impetus given every department of endeavor under the new regime.

## THE MINING RESOURCES OF THE PHILIPPINES

*(Continued from page 220)*

tinued development but little. The operators seemed to realize that a few failures of hastily planned enterprises were no indication of the true worth of the ore bodies, and consequently began slowly to start operations on a more solid basis.

"In Benguet, the Major Mines Company erected a six-stamp mill with concentrating tables and spent large sums in surface construction, houses, sawmill, ore bins, tramways, roads, etc., preparatory to taking out ore. The Headwaters Company began the installation of a ten-stamp mill with complete cyanide equipment, and Mr. McElroy built a three-stamp mill. The Consolidated again began operating on a paying basis and the Bua tore down the old mill with the hope of building a larger one in a more suitable location. Farther south in Benguet, near the Pangasinan line, Messrs. McMichaels and Lambert are preparing to erect a Huntington mill on their property at Lubang. All of these companies have been pushing development work, as have many others in this district, although at present without any mills, and a large number of promising showings have been encountered.

"In Nueva Ecija and the adjoining country to the east, paying placer deposits have been met with and arrangements have been made for installing dredges. Platinum has been found in this district, and the country to the south.

"In Ambos Camarines, the Paracale Company built a new pontoon and put up a crusher and Huntington mill for treating the rich boulders raised by the dredge; the Philippines dredge was moved to the Maliguit River where it has at last proved a success; and arrangements have been made to build a dredge on the Gumaus River.

"In Masbate, the Colorado Company is erecting a twenty-stamp mill and cyanide plant, and several other companies have started with renewed activity to develop ore and prepare for mills.

"In Marinduque an English company has carried on operations and erected a three-stamp mill with concentration tables on a property 20 kilometers south of Santa Cruz.

"Numerous good reports continually come from Surigao, Mindanao, where several Americans are prospecting placer ground. Mindoro also shows promise in this direction, and it is very probable that dredges or some sluicing machinery will be placed in one of these districts before long.

"This present year will be an improvement over all the previous ones, for conservative men have been investing in a conservative manner."

Mr. Eddingfield also contributes an article on the Aroroy Mineral District of Masbate which is of special interest since it includes the Colorado Mining Co.'s property upon which a large mill recently installed is now operating. The outcome of this adventure means much to the future of gold mining in the Philippines. He gives the following description of the Colorado property and the progress made up to the end of the year:

"The Colorado mine is located on Bagadilla Mountain, and the vein on which most of the development work has been done outcrops very near the crest of the hill, striking about S. 45° E. dipping 70° to the NE. The highest point of the vein is about 320 meters above sea level and fully 290 meters above the boiler floor of the mill.

"There are two main tunnels driven along the foot wall of the vein. No. 1 is 30 meters below the highest point in the outcrop, and opens up the vein for a distance of 210 meters, No. 2 is 55 meters on the incline below No. 1 and opens up the vein for a distance of 380 meters. A third level, known as the 'intermediate,' is being driven 20 meters above No. 2, connecting three raises from No. 2 with the main shaft. These raises contain ore chutes and manways ready for stoping on the intermediate. On the first level, crosscuts have been driven at short intervals to the hanging wall and drifts have been driven in both directions along the hanging wall to connect the crosscuts, forming a main haulage way.

"A two-compartment incline shaft was sunk on the vein from the SE. opening of No. 1 to a depth of 122 meters on the incline. Crosscuts were driven between the walls of the vein at intervals of about 15 meters down the shaft.

"The vein varies in width from 3 to 12 meters, but averages about 5 meters. It is a quartz manganese vein containing calcite in depth, but honey-combed in the upper levels from the leaching away of the calcite. It presents a very marked ribbon or banded appearance from the layers of quartz, iron, and manganese. This banding is generally parallel to the walls, but in some places it is seen in circular form, probably because of movement in the fissure. Numerous irregularities occur in the dip and strike of the walls, and horses of wall rock are frequently encountered in the vein. These features are characteristic of the district as a whole.

"The hanging wall of the vein is a much decomposed andesite. The foot wall has the appearance of being a separate intrusion of a highly mineralized, light-colored, semi-granitic mass filled with impregnated quartz, having a width of about 20 meters on the second level. This seems to indicate that the vein is a contact deposit.

"Oxidation has been carried on to a greater depth in this district than in any other known section of the Islands. The ore is in a much oxidized state even at the foot of the shaft, but the wall rock is only slightly altered.

"Water should cause no trouble in the mine for almost one hundred meters more in depth. This presents a possibility of developing over one million tons of ore above the permanent water level.

"The vein is said to average 14 dollars to the ton, along the No. 1 and No. 2 drifts. Some values as low as 8 dollars and as high as 60 dollars were reported, showing irregularity in the distribution of values in various parts of the vein. However, it is a peculiar fact that a careful screening test of a sample of ore showed practically equal values for eight different screen products. The ore cyanides well, requiring but little lime for alkalinity and showing a good extraction of values with a moderate consumption of cyanide.

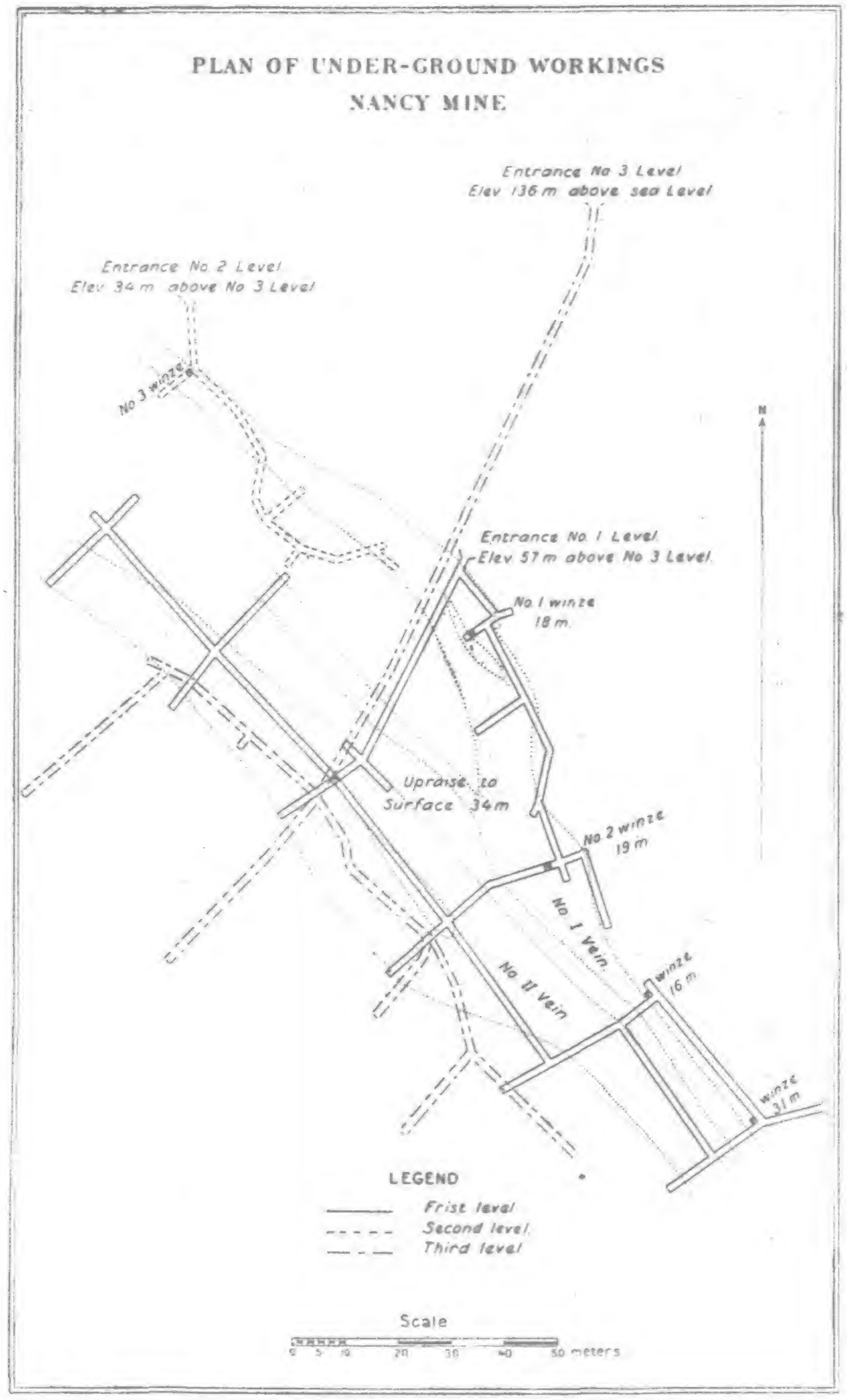
"The ore will all be taken out of the second level and lowered to the mill in a Seschen two-bucket rope tramway 320 meters long, having a pitch of 26°. The mill has the following process:

"(1) Grizzly bars and crusher. (2) Ore bins, 200-ton capacity. (3) Challenge ore feeders. (4) Stamp battery, 20 stamps, 1,250 pounds each. (5) Dorr classifier. (6a) Sands to 2 tube mills, 56 inches by 16 feet. (6b) Elevator to Dorr classifier. (6c) Slimes from Dorr classifier to Dorr thickening tank, 14 feet by 28 feet. (7a) Overflow to tank, 5 feet by 6 feet. (7b) Triplex pump, to (7c) battery storage tank, 16 feet by 24 feet, on orebin level. (7d) Underflow Dorr thickener to 2 air lift Pachuca tanks, 40 feet by 12 feet diameter. (8) Second Dorr thickener. (8a) Overflow to clarifying boxes. (8b) Zinc boxes. (8c) Sump. (8d) Triplex pump, to (8e) strong solution tank, 8 feet by 20 feet diameter. (8f) Underflow of Dorr thickener to agitation tank, 8 feet by 20 feet. (9) Two Oliver filters. (9a) Solution, to wet vacuum pump, to (9b) storage tank. (9c) Centrifugal pump to (9d) Second zinc boxes, (9e) to sump or to Oliver filter for wash solution. (9f) Pulp, to waste dump.

"Water is obtained from 14 wells in series located below the mill. It is pumped to one high-head storage tank above the mill and one low-head storage tank on the second Dorr thickener level.

"The power plant consists of three 100 horsepower boilers, and one 250 horsepower Bates-Corliss engine with hemp rope drive.

"The location is very favorable. Wood for fuel is moderately cheap and plentiful The mill is about 1 kilometer from the nearest navigable stream, and only about 5 kilometers from a good harbor."




NANCY MINE, MASBATE

The other properties in this district referred to in this paper upon which work was in progress, are the Eastern, the Tengo and the Keystone. No. 1 vein in the Eastern where opened up is referred to as appearing remarkably good and above the second level presents a possibility of having over 100,000 tons of ore averaging from 9 to 10 dollars per ton. The Tengo company has been developing a new vein and repairing the ten stamp mill formerly placed on the property. The Keystone company is prospecting claims on Ororoy mountain and have installed air drills, the first used in the islands for mining purposes.

The Developments in the Baguio District is the subject of a paper by Warren D. Smith, Ph. D., Chief of the Division. He writes:

"If the statistics of production alone were to be considered, then the past year has been one of stagnation and suspension of work, in this district, but an examination of the properties shows that it has been one of recuperation and preparation for more active operations.

"*Benguet Consolidated Company.*—The Benguet Consolidated Mill and the Bua Mill suffered

severely from a storm in October, 1909. The latter suspended all operations, but the former continued development work and has consistently turned out over 100 ounces of bullion per month from its amalgamating plates. The company is more than making expenses and the mine has been kept in excellent condition. There is no question but that this company controls one of the largest ore bodies in the Philippine Islands.

"*The Headwaters Mining Company.*—The Headwaters Mine, located on the headwaters of the Antamok River, has recently completed the installation of an all-sliming cyanide plant consisting of the following:

"Rock crusher, ten-stamp Hendy mill, classifier, Hardinge conical mill, Fremier sand pump, classifier, slimes thickener tank, 2 Pachuca tanks for air agitation, pulp tanks, gold solution tanks, storage tanks, Ridgeway vacuum filter with necessary pumps, zinc boxes, Pelton water wheel, gasoline driving engine, and air compressor.

"This mine has a fair supply of ore blocked out on a strong lead which can be traced for several thousand feet on the surface and which is reported to average 16 pesos to the ton. Samples taken by members of the Division of Mines have run much higher.

"*Other Properties.*—The Major Mining Company on Major Creek, one of the numerous branches of Gold Creek, has in operation a six-stamp Hendy mill and intends shortly to put in a small cyanide plant.

"The Comote-Clayton property, which lies east of the Benguet Consolidated, presents some very good free-milling ore and the three-stamp mill which was erected several years ago is again being placed in condition. This mill is small but should yield a profit on the rich ores of the property.

"The Muyot Mining Company has not as yet installed machinery. However, its mine to-day is probably among those, which have not yet begun milling, the best developed property in the district.

"Mr. J. E. Kelly, at Bua, has four strong leads which give promise of developing a large deposit of rich ore.

"Mr. H. O. Hibbert, the locator of the Headwaters property, has taken over a large interest in the mine and claims of Mr. J. P. MacElroy on Emerald Creek. Mr. MacElroy, previous to the sale, had installed a three-stamp mill which was made in Manila.

"Other properties are held by Mr. J. E. Huiskamp in Batwaan; Mr. Calvin Horr, on the Ascension group, located near the Kias trail, and by Mr. Alexander Pau on the property north of the Major Group. All are carrying on development work and have uncovered some promising leads.

"No other than annual assessment work has been done on the Topside and Reliance groups. However, the geologic features of the district are such that an extensive, and probably rich, ore body could be developed.

"The Bonanza group which lies adjacent to the Headwaters on the east has good ground, although undeveloped.

"One of the most promising properties in the district is that worked by Messrs. Probeck and Ebert on the "Inca" and associated claims. The "Inca" vein is about 21 meters wide and pans remarkably well. A one-stamp mill, for prospecting purposes only, has just been set up here.

"The mining men of this district are preparing a petition to the government asking for a permanent district mine warden. The idea of mining wardens came from the Australian mining men who are located in the district, and I believe that the more Australian ideas we adopt here in mining, the better off we shall be. The Australian mining law to-day is perhaps the best in the world.

"The division of mines has completed its report on the ore deposits of the district. The work was begun in 1906 by A. J. Eveland who made a topographic map and contributed notes on the geology of the district. This map has been revised and a fairly complete study of all the properties has been made.[1] The work has been done by Mr. F. T. Eddingfield, mining engineer, and the writer as geologist. The following facts seem to be fairly well established in regard to the ore deposits in the Benguet district:

"(1) The ore deposits are intimately related to igneous intrusions. (2) Gold is found in quartz fissure veins in andesitic intrusions; (3) In calcite veins, probably not fissures, but in andesitic intrusions; (4) In contact zones between sedimentaries and andesitic intrusions. (5) Gold was deposited from ascending waters. (6) The gold is associated with pyrite and in one locality with tellurium. (7) The gold veins in many cases carry much manganese oxide. (8) The ores are only partly free-milling. (9) There has been some secondary enrichment. (10) The ore deposits are found in a region of great rainfall and steep slopes. (11) The zone of oxidation is shallow. (12) Although none of the mines has gone below water level, the indications are that many of the deposits will become richer with depth.

The needs of this district are as follows:

"(1) Capital. (2) A hydro-electric power plant on the Agno River to run mills of a large capacity. (3) More development work. (4) A mine warden. (5) A location tax. (6) Greater publicity.

"The labor question in this district seems to be very favorable. When the Filipino becomes trained, he proves very satisfactory. The only trouble which arises is generally through lack of numbers. The Filipinos at present used in underground work are drawn from the rice fields of the lowlands."

Paracale-Mambulao District in which the greatest interest is taken on account of its rich placer properties is the subject of an interesting paper by Paul R. Fanning, S. B. He writes:

"Measured in terms of production, the mining industry in the Paracale-Mambulao district did not progress as much as was expected, and the output for 1910 shows an actual decrease from that of 1909; but measured in terms of future probabilities, the district is to-day in a more secure position than at any time in its history.

1 This map and paper will appear shortly in the *Philippine Journal of Science*.

*Gold production by years* [1]

[In pesos Philippine currency.]

| *1907* | *1908* | *1909* | *1910* |
|---|---|---|---|
| 4,000 | 152,270 | 216,701 | 171,900 |

"A decrease of 44,801 pesos is to be noted between the production of 1909 and that of 1910. However, this retrogression is merely temporary and does not in any way mark the beginning of a decline. It can be attributed to the non-operation of the Paracale dredge for six months of the year during the construction of a new pontoon.

"During the year the Stanley dredge contributed to the production, and the Philippine's dredge, San Mauricio and Tumbaga mines entered the field as producers.

*Gold production by companies in pesos, Philippine currency, 1910.*

| | |
|---|---|
| Paracale Gold Dredging Co..... | 69,855.00 |
| San Mauricio Mining Co..... | 34,350.00 |
| Stanley Gold Dredging Co..... | 41,000.00 |
| Tumbaga Mining Co..... | 9,045.00 |
| Heise Dredging Syndicate..... | 17,650.00 |
| Total..... | 171,900.00 |

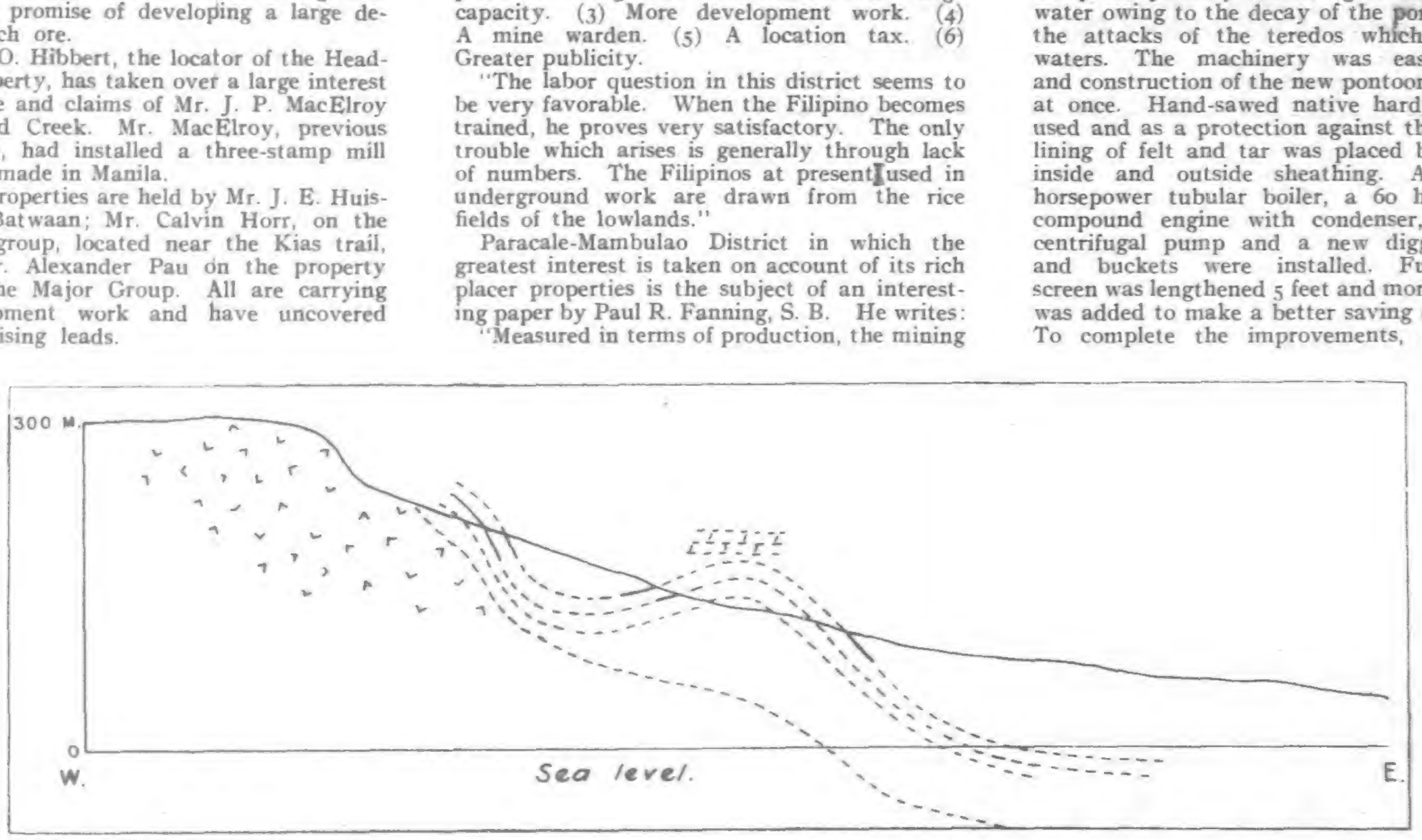
"*Dredging.*—The greatest confidence can be felt in future production from dredging, and the output of the district during the next few years will depend to a great extent upon this work

"During the year greater attention was paid to the testing of placer ground, and several properties are now in a position to command capital for the purchase of a dredge. Among these can be named the Gumaus, the Paracale Extension, and the Philippine Gold Dredging Company.

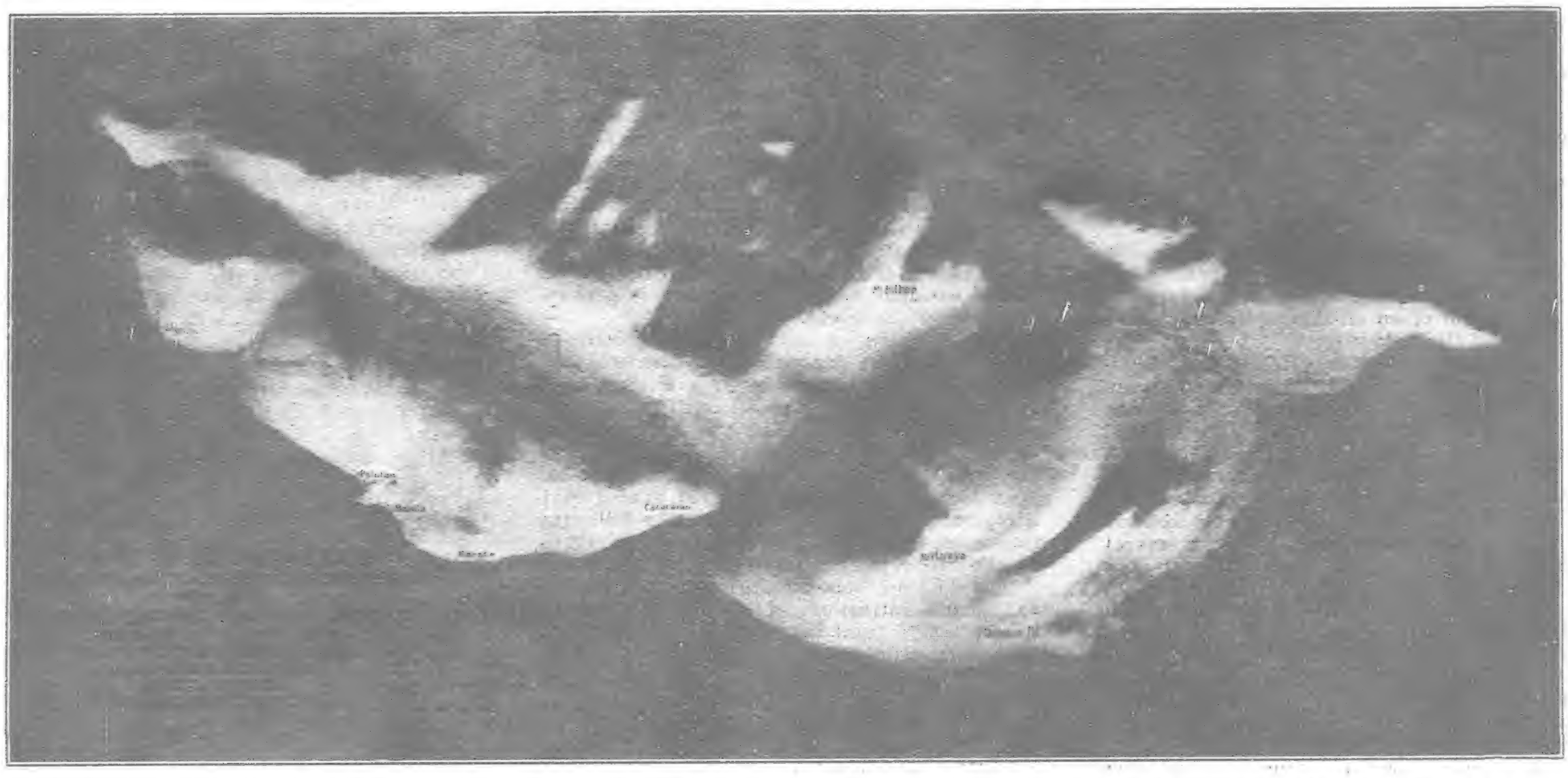
"*The Paracale Gold Dredging Company.*—The Paracale dredge operated for six months and produced 69,855 pesos worth of bullion, or one-third of the output of the entire district. Early in January the dredge sank in shallow water owing to the decay of the pontoon under the attacks of the teredos which infest the waters. The machinery was easily salved, and construction of the new pontoon was begun at once. Hand-sawed native hardwoods were used and as a protection against the teredos a lining of felt and tar was placed between the inside and outside sheathing. A new 120 horsepower tubular boiler, a 60 horse power compound engine with condenser, a 12-inch centrifugal pump and a new digging ladder and buckets were installed. Further, the screen was lengthened 5 feet and more table area was added to make a better saving of the gold. To complete the improvements, an electric lighting system was installed. The capacity of the buckets remains 4 cubic feet as formerly, but increased yardage is obtained by a bucket speed of twelve per minute instead of nine.

These improvements resulted in splendid yields of bullion, and from July to January

1 Some silver is alloyed with the gold.




IDEAL SECTION IN PART OF THE POLILLO COAL FIELD



the average production was close to 10,800 pesos per month. This dredge still has a large acreage of rich ground and its future yearly production should well exceed that of the past.

During the latter part of the year a mill was being constructed for the treatment of the rich quartz boulders brought up by the dredge. A Huntington mill and Wilfley table will be used, and as there are several thousand tons of boulders on the dump, a splendid yield should be obtained. [1]

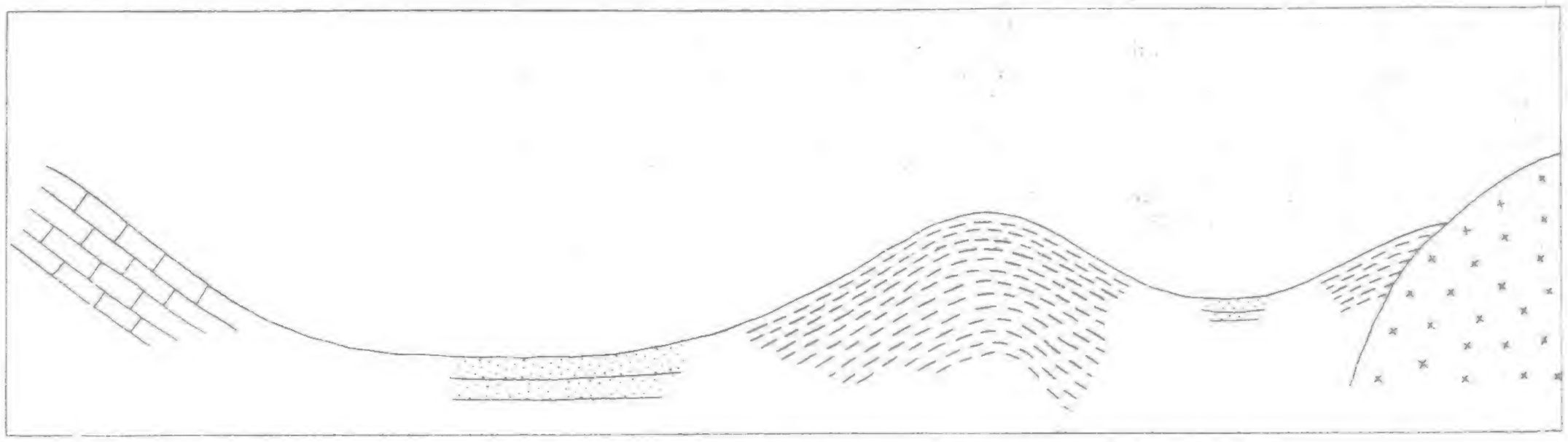
*"The Stanley Gold Dredging Company.*—The Stanley dredge operated very irregularly during the year and produced 41,000 pesos wotrh of bullion. This is a very creditable showing for the ground, as the machinery is not only in bad shape, but the design of the dredge, lacking as it does a revolving screen and sufficient gold saving devices, renders it incapable of making a close saving of the gold.

*"The Philippine Gold Dredging Company.*—The Philippine's dredge had proved itself too weak to handle the deeper material and during 1910 operated on its own ground for only a few hours. Early in the year the dredge was leased to the Heise Dredging Syndicate and later moved to the Malaguit River. The owners of this dredge are now in a fair way to receive a large return for their money, and it is quite probable that a new dredge will be bought, so constructed as to handle their own ground which is said to be of good value.

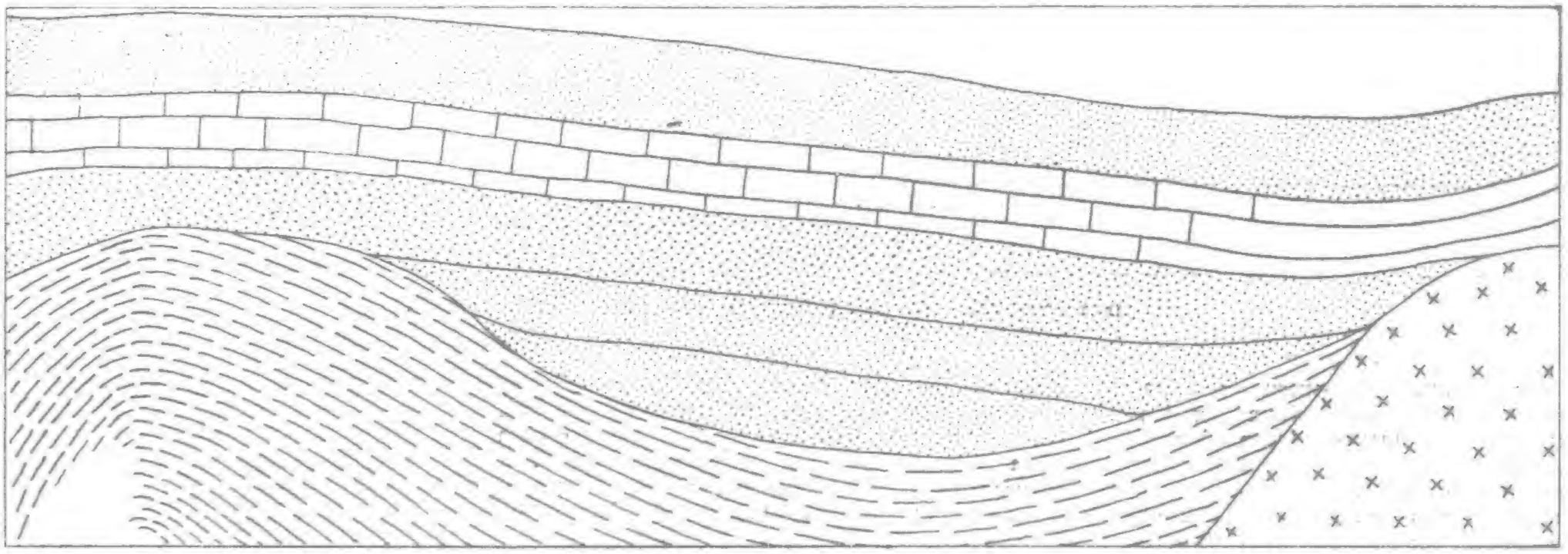
*"The Heise Dredging Syndicate.*—This Syndicate secured a lease on the Philippine's dredge and in August it began work on the Malaguit River. Various difficulties resulted in small returns for the first few months' work. The pay-channel was reached toward the middle of December, and in the period from December 15 to January 1 excellent cleanups were obtained.[1]

1 This mill is now reported to be saving twenty pesos per ton by amalgamation alone.

1 This dredge has averaged close to 7,200 pesos per month during the period from January to May, 1911



TAVABAS OIL FIELDS.—POSSIBLE SECTION FROM MONTATAJA TO THE VIGO RIVER



TAVABAS OIL FIELDS.—POSSIBLE SECTION EAST AND WEST

"*The Tumbaga Gold Mining Company.*—The Tumbaga mine continued its shaft to the 200-foot level and cross-cut to meet the vein. It is understood that the vein was not met, and as indicated by the winzes from the first level, the probability is that the stringers have pinched or faulted. However, in the upper workings a pocket of extraordinary ore was discovered which by smelter returns gave 9,045 pesos on a shipment of 2.5 tons.[1]

"*The Navotas Group.*—The Navotas property came into prominence by the discovery of some rich surface specimens containing visible gold. Capital was secured and a hoisting plant was installed. A shaft was sunk 30 meters and a cross-cut run to meet the vein, but as the mine is now indefinitely shut down, it is probable that the vein met did not come up to expectations."

Mr. Fanning adds interesting information on the geology, ore deposits, and metallurgy of the district which will prove of great assistance in guiding those interested in future development. This is particularly true of the treatment of ores in this district which heretofore has not been of a character best adapted to secure results. On this subject he writes:

"The 10-stamp Longos Point mill relied upon amalgamation alone to save the values. The ore was refractory and probably less than a 20 per cent saving was made. The 20-stamp San Mauricio mill used amalgamation and concentration on Traylor tables, but the extraction was seldom above 40 per cent. The Tumbaga ore was unique in its free-milling quality, and the Huntington mill and vanners would probably have made a good saving. The quartz boulders brought up by the Paracale dredge are fairly well adapted to amalgamation and concentration, so that the mill installed (a Huntington mill and Wilfley table) will probably make a good saving.

"Because of the lack of developed ores, it is as yet impossible to state definitely what treatment will give the best results. Owing to the nature of the ore, its variations in value and in mineralogy, each mine must make elaborate tests to determine the process which it will adopt.

"Most of the ores of the district are of too small value to permit shipping to smelters. Further, the indications are that the ores generally are refractory to amalgamation and concentration. Many of the surface ores contain so much copper as to prevent successful cyaniding. The probability is that with depth many such ores will possess little or no copper and so will become adapted to cyanide treatment. Tests made by the writer indicate that fine grinding, possibly combined with slime concentration, and air-agitation in cyanide solution will give an excellent extraction."

The subject of coal resources is covered by a paper from the pen of Dr. Warren D. Smith. The large importations of coal reaching 377,355 metric tons make the development of the coal measures of the archipelago most important. The only mines operating is the Batan Company's plant from which was realized 27,000 metric tons, of which 18,000 tons entered the market in competition with imported coals.

The principal known coal deposits are found on Batan Islands, Cebu, Polillo, Mindoro, Masbate, and Mindanao. After an exhaustive review of the geology of the different deposits, Dr. Smith gives an epitome of the utilization of Philippine Coal as follows:

"Philippine coal can be used in the following ways: (1) Burned alone; (2) mixed with better coal; (3) in gas producers; (4) in the shape of briquets.

"1. Coal from Polillo, Cebu, and Sibuguey and Dumanquilas Bays, Mindanao, can stand on their own merits and be burned alone for steaming and other purposes. They are all bituminous coals with the exception of the coal from the last-named locality and that would more properly be called semi-anthracite.

"2. Coals like those from east Batan, Mindoro, and Dinagat while capable of being burned alone in properly constructed grates are materially improved by being mixed with Australian coal. The Manila Electric Light and R. R. Company has done this with very satisfactory results in the case of Batan coal. These coals can be made to produce much better results by using finer grates, longer fire-boxes and some device for returning the unburned gases through the furnaces before passing up the chimneys.

"3. Batan coal has been used in a German gas-producer which is expected to be on the market very soon. One of these has been bought by the Bureau of Science. The gas producer will undoubtedly play an important factor in the future of Philippine coal.

"4. Experiments on the briquetting of Philippine coal have recently been undertaken.

"The Bureau of Mines in Washington is now experimenting with Philippine coal in perfected machines. As one briquetting machine costs in the neighborhood of 60,000 pesos, the Bureau of Science has been unable, owing to the lack of funds, to take up this important line of investigation on a large scale, but has done what it could with the apparatus at hand.

"Coal briquets have been made both with and without binders in the laboratory of the division of mines. The latter method is not usually productive of satisfactory results. The possible binders for coal briquets are the following: (1) Pitch; (2) starch; (3) molasses; (4) sugar mill waste (bagasse); (5) tar from gas plants; (6) rice polishings (tiqui-tiqui).

"The first and fifth in this list are out of the question now, for we have no local supply. The second can not be considered because starch will bring more in the market than will the briquetted coal. No molasses is made in the Philippines. No. 4 might be utilized but has not been tried so far. This is used by itself as fuel in the sugar districts. The sixth has been used by us in our experiments in the Bureau of Science with the results that a very fair briquet has been made.

"In conclusion we might sum up the unfavorable and the favorable features connected with the subject of coal in the Philippines. The less favorable features are:

1. Some pinching of the seams in places.
2. Weak roof and floor in some fields.
3. Inferior grade of the coal in some of the more accessible fields.
4. The labor at present is almost unskilled.
5. Difficulties attending exploratory work, such as the jungle, lack of roads, etc.

"The more favorable features are:

1. An exceptionally good local market.
2. Cheapness of the labor (per diem). The labor is easily managed.
3. Abundance of timber.
4. Distance from possible competitors.

"Whether these last named can offset the first is only to be ascertained by actual trial. The writer believes they can and that coal mining can be carried on at a profit in the Philippines.

"Any estimates of the amount of workable coal available in the different fields would be only guesses in the absence of more development work. There seem to be, however, many million tons which can be extracted from the total area of land in the Archipelago underlain by coal."

Other subjects treated are "The Tayabas Oil Fields" by Mr. Eddingfield, "Philippine Placers" by R. Y. Hanlon, "On Briquetting Philippine Coals" by Wallace E. Pratt, besides an interesting collection of tables by F. T. Eddingfield on cost of mining in the Philippines. These tables follow:

"The costs of mining can be divided into two main groups: (1) Cost of labor; (2) Cost of supplies. In any one district where the actual cost of supplies per unit, and of labor per man, are uniform, the peculiar condition of the ore, the character of the country rock, the efficiency of labor, the efficiency of the process employed in mining or milling, and the policy of the management are elements which cause variation in the total cost per ton of ore. For this discussion, data from the three principal mining districts of the Philippines have been secured, i. e.: (1) Baguio mineral district, Benguet, Luzon. (2) Paracale, Ambos Camarines, Luzon. (3) Aroroy, Masbate. I intend first to tabulate the cost of labor and supplies in these various districts and then to discuss the special characteristics referred to above.

*Cost of white labor*
(In Pesos Philippine Currency.)

| | Baguio. | | Paracale, per month. | Aroroy, per month. |
|---|---|---|---|---|
| | Per month. | Per day. | | |
| Superintendent | 300-500 | | 300-500 | 300-500 |
| Engineers | a300 | | a250 | a300 |
| Mine Foreman | | 12 | 250 | |
| Mill Foreman | | 15 | 250 | |
| Shift bosses, mine | | | 200 | |
| Shift bosses, mill | | | 200 | |
| Mechanics | | 10 | 300 | a300 |
| Carpenters | | | 250 | |
| Clerks | | 8 | 150 | |

a Average.

*Table of mine cost.*
[In pesos Philippine currency.]

| | Baguio, | | Paracale. | | Aroroy. |
|---|---|---|---|---|---|
| | No. 1. | No. 2. | No. 1. | No. 2. | |
| Drifting, per foot | | | | | 3.10 |
| | | | | | 2.50 |
| Cross cutting, per foot | | | | | |
| Timbering: | | | | | |
| Per foot drift | | | | | 45.00 |
| Per foot shaft | | | | | 5.00-6.00 |
| Shaft sinking, per foot | | | | | |
| Raising, per foot | | | | | |
| Milling, per ton | | | | | |
| Fuel, per ton | | | | | |

a Contract. b Over.

*Costs for shipping concentrates.*
[Figures in pesos per ton.]

| | | Benguet Consolidated, Baguio, Benguet. | San Mauricio, Paracale District, A. C |
|---|---|---|---|
| Transportation | Antamok to Baguio | 15.00 | Mine to dock | 0.80 |
| | Baguio to Camp 1 | 30.00 | Loading steamer | 0.80 |
| | Camp 1 to Manila | 10.00 | Freight to Manila | 4.20 |
| | Handling Manila | 2.60 | Lighterage Manila | 3.00 |
| | Freight to Seattle | 6.00 | Wharfage Manila | 1.00 |
| | Freight dock to smelter | 0.86 | Storage Manila | 1.00 |
| | | | Freight to Tacoma | 6.00 |
| Total | | 64.46 | | 16.80 |
| Treatment charge | | 12.00 | | 15.00 |
| Total charges | | 76.46 | | 31.80 |

1 At this date the mine has indefinitely shut down.

*Cost of Supplies.*
[In pesos Philippine currency.]

| | Baguio. | Paracale. | Aroroy. |
|---|---|---|---|
| Mine timbers: | | | |
| Rough | Pine, 7 to 8 feet long, 0.10 per inch diameter. | Hardwood, 15 feet long, 0.10 per inch diameter. | Hardwood, 12 by 12 inches, 0.40 per running foot. |
| Framed | 2.15 per set. | | |
| Fuel | Gasoline, .65 per gallon; pine, 2.50 per cord. | Native wood, 3.75 per cord. | Native wood, 3 per cord. |
| Explosives | Caps, 2 per box, dynamite, 20 per case; fuse, 2 per 100 feet. | Batan, 10 per ton. Dynamite Atlas, 40 per cent, 650 per ton. | Dynamite, 650 per ton. |
| Candles | 7.50 to 16.50 case. | Goodman, 9. | |
| Lumber | Lagging, 7 feet by 5 inches, 0.10 each; rough lumber, 95 per M. | R. O. pine, 65 per M board feet. | 60 to 85 per M board feet. |
| Pipes | 18 inches slip joint 3-16 inch by 10 feet, 39.54; 14 inches flange, 3-16 inch by 8 feet 30.25. | Small pipes, 0.25 to 0.75 per foot. | |
| Drill steel | ½" to 1.", 0.60 per kilo. | 12 pounds T, 1.90 per foot. | |
| Rails | 7 kl. German 1.75 per meter. | | |
| Tools: | | | |
| Shovels | R. D. P. H., 1.95. | R. D. P. H., 1.00. | |
| Picks | Drifting, 2.25. | Drifting, 0.75. | |
| Hammers | 3, 6, and 8 pounds, 2 to 6. | 4 and 8 pounds, 0.25 per pound. | |
| Wheelbarrows | Iron, 18.50. | Iron, 11.50. | |
| Lubricating oil | Cylinder, 2.55 per gallon. | Cylinder, 1.50 per gallon. | 5.60 per barrel. |
| Cement | 12 per barrel. | 5.60 per barrel. | |

*Cost of native and Oriental labor.*
[In pesos Philippine currency per day]

| | Baguio. | Paracale. | Aroroy. |
|---|---|---|---|
| Capatases, mine | 1.40-1.50 | 1.50 | 1.50 |
| Capatases, mill | 1.40-1.60 | 2.50 | |
| Shift bosses, mine | 1.50 | | |
| Mechanics | | 2.50 | |
| Carpenters: | | | |
| Japanese | 3.00-3.25 | 3.00 | |
| Natives | 1.00 | | |
| Miners and muckers | 0.80-1.40 | a1.05 | 1.00 |
| Timbermen: | | | |
| Japanese | 3.50 | | |
| Natives | 1.50-2.00 | | 1.20 |
| Pumpmen | | 1.25 | |
| Hoistmen | | 2.00 | |
| Blacksmiths | | 2.75 | |

a Average.

*Shipping charges from Manila to destination.*
[In pesos per metric ton or cubic meter].

| | Paracale. | Masbate. | Baguio. |
|---|---|---|---|
| Machinery | 4.60-5.70 | 3.10-3.80 | 60.00 70.00 |
| Lumber | 4.20-4.60 | 3.70-3.00 | |
| Cement | 6.70 | 4.80 | |
| Ore | 1.20-4.60 | 2.70-3.10 | |
| Dry goods | 6.70 | 4.80 | |
| Canned food | 6.70 | 4.80 | |
| Coal | 4.20 | 2.70 | |

*Cost of mining, milling, etc., at Baguio and Paracale*
[Figures in pesos per ton].

| | Baguio. | | Paracale. |
|---|---|---|---|
| | A. | B. | |
| Cost of mining | 1.00 | 9.13 | 9.00 |
| Cost of milling | 1.00 | | 2.00 |
| General and administration cost | 1.00 | | 2.00 |
| Total | 3.00 | 9.13 | 13.00 |

*Table of rate of work.*

| | Baguio. | Paracale No. 2. |
|---|---|---|
| Tons mined per day | 75 | 50-75 |
| Feet advanced per shift per drift | 2 | 1 |
| Feet sunk per shift (shaft) | 0.5 | 0.33 |
| Feet sunk per shift (winze) | 1 | 0.5 |
| Feet raised per shift (raise) | 1.5 | 1 |
| Feet drilled per shift per man | 7 | 4-6 |
| Men per ton of ore | 2 | 3-4 |

*Philippine Division of Mines.*—The Division of Mines, Bureau of Science, Philippine Islands, announces the completion of the new assay office. The growth of this department has so increased as to have necessitated further expansion. The capacity hitherto has been very limited, but owing to the recent installations of crushing and pulverising machines, large orders can now be handled with great facility. These machines represent the most modern types of apparatus for the preparation of ores for assaying and by the use of compressed air, a perfect cleaning can be made and so eliminate the possibility of salting the samples.

The erection of the coal assay furnace from the Denver Fire Clay Co. along with a Braun Gasoline furnace will permit of the assay of over 100 samples per day. This makes the plant probably the largest and most complete in the Orient.

In connection with these improvements, apparatus for the laboratory tests of ores has been added and it is now possible to determine in Manila the method of ore treatment and the type of mill to erect at the mine. With the increase of its facilities in the direction of assaying and ore sampling, the Bureau of Science is in a position to give rates on large lots submitted to it.

Several mills in the Philippine Islands have been failures owing to the type of mill erected. Preliminary testing of the ores to be handled in these mills would have indicated the right sort of a mill and so would have resulted in successful operation. The great uncertainty, expense, and time hitherto required for the shipment of lots of ore for testing in the United States are now eliminated as the present plant of the Bureau of Science can determine the various modifications in the process to be used. In order to assist the mining industry as much as possible, the charges for ore-test will only cover the actual cost of the work to the Bureau. Tests will be made from ₱25 00 up, varying with the difficulties and the number of tests and assays required.

At present the following points can be determined:

(1) Percentage recoverable by amalgamation.

(2) Percentage recoverable by rough concentration.

(3) Treatment of the concentrates.

(4) Adaptability of the ore to cyaniding, including such considerations as crushing in cyanide solution, amalgamation, concentration, leaching, sliming, fineness of ore for most economical extraction, time for extraction, strengths of solutions, ratio of solution to ore, use of oxidizing agents, feasibility of roasting, etc.

(5) Combination of various methods with amalgamation, concentration, chlorination, or other mechanical process.

The need for such work has long been recognizedand tests have already been made on ore shipments from Paracale, Masbate, Benguet, and China.

The work will be under the direct supervision of Mr. Paul R. Fanning, graduate of the Massachussetts Institute of Technology and formerly assistant in Henry E. Wood's Testing Laboratory in Denver. Mr. Fanning has had extended experience both in the testing of ores and in their actual mill treatment.

*Sampling for valuation.*—Owing to the variability of the ores of a mine, both in nature and in value, the proper sampling of the veins is amatter of considerable difficulty and a work requiring both experience and judgment. Preliminary sampling of the various workings are first made in order to know the values and average of the ore. These samples are obtained by cutting out grooves at right angles to the strike and dip of the vein. The groove should be from four to eight inches wide and from one to four inches deep. A sample is obtained weighing about 20 pounds to the running foot and no sample should be taken over four feet in length. Where the vein is wider than four feet, two or more samples should be taken and the groove should be continuous in the same straight line. Rich or poor streaks should be sampled separately and where the sample can not be taken perpendicular to the vein, proper allowance should be made in order to obtain the correct length. Grab samples should never be taken, as they do not represent an average of the ore.

*Sampling for ore testing.*—When the preliminary sampling and assaying has been completed, it will then be possible to tell where to take the samples for ore testing. When the ore is of regular nature and value, this sampling is comparatively easy and the ore can be picked down from the various faces. The face is first cleaned off by picking and then a slice about six inches deep is taken off the whole face, using the greatest care not to include more fines than should properly belong in the slice. It is advisable to include in the ore as much wall rock as would ordinarily be mixed with the ore in stoping. The sample should be broken down into a box or large canvas spread on the floor. This sample is then taken outside, coned and quartered and the proportionate amount added to the samples taken in the same manner in other places. A sample weighing from 5 to 20 tons is thus obtained which can be broken, coned and quartered to from 500 pounds to 2 tons. This should then be boxed or sacked and shipped for ore testing.

When the mine has very spotty values or the ore is of irregular nature such as being irregularly high or low in manganese, calcite, copper, or sulphides, the samples always should be mixed in such proportions as will represent the ore later to be treated by the mill. It is useless, for instance, to test an ore where the sample shows little copper, when the average mine-ore would show a considerable percentage of copper. In the same way, when the average mine-ore is $5 it would be very misleading to make a test on a sample where the value is $8. The value of the ore is a most important consideration in the testing of ores and in the design of a mill.

# PRINCIPAL MINES IN CHINA WORKED BY FOREIGN METHODS*

## COAL.

(1) *The Kaiping collieries* at Kaiping and Tongshan, in Chihli province, on Imperial Railways of North China, 80 miles from Tientsin. Opened in 1878. Owned (since 1900) by the Chinese Engineering and Mining Company, Limited (British).

Average daily capacity: Tongshan mine, 2,700 tons; Linsi, 2,700 tons; North-west Shaft, Tongshan, 600 tons; total, 6,000 tons.

Output in 1909, 1,361,730 tons; in 1910, 1,174,312 tons.

PRICE per Ton (Wholesale) Coal.

| At— | Navy Lump. | | Loco. Lump. | |
|---|---|---|---|---|
| | Dol. c. | s. d. | Dol. c. | s. d. |
| Chinwangtae (shipping port on Gulf of Pechili, connected by rail with mine, 85 miles) | 8 0 | 14 0 | 7 0 | 12 3 |
| Tientsin | 8 50 | 14 10 | 7 50 | 14 1 |
| | Taels c. | | Taels c. | |
| Shanghai | 7 0 | 17 6 | 3 0 | 15 |

*Memorandum on Chinese Mines, by Mr. H. H. Fox, Acting Commercial Attaché to His Majesty's Legation at Peking, in British Diplomatic and Consular Reports.

| At— | Linsi Lump. Dol. c. | s. d. | Slack. Dol. c. | s. d. |
|---|---|---|---|---|
| Chinwangtae (shipping port on Gulf of Pechili, connected by rail with mine, 25 miles).... | .... | .... | 5 0 to 6 0 | 8 9 to 10 6 |
| Tientsin ..... | .... | .... | 4 50 to 5 50 | 7 10 to 9 7 |
| | Taels c. | | Taels c. | |
| Shanghai..... | 5 50 | 13 0 | 4 50 | 11 3 |

Quality—Bituminous, lump and slack; suitable for locomotives, steamers, mills, steel makers, &c.

Head office—Tientsin. London office—22, Austin Friars, E.C.

(2) *Lanchow collieries*, at Lanchow, in Chihli province, on Imperial Railways of North China; 83 miles from Tientsin. Owned and worked by Chinese company in opposition to Kaiping mines. Modern machinery. German engineers.

Average daily capacity 4,000 to 5,000 tons. Output about 1,000 tons daily; will probably be increased during the coming year.

Prices about the same as Kaiping in North China, but, so far, have not exported any coal.

Quality—Bituminous; lower grade than Kaiping, very dusty, only suitable for local Chinese purposes.

Head office—Tientsin.

(3) *Pekin Syndicate mines*, at Ching Hua Chen, in Honan province. Railway connection with Tientsin and Hankow viâ Tao-Ching Railway to Hsin Siang, on Peking-Hankow Railway, or by Wei River and Grand Canal to Tientsin. Opened in 1905. Output began in 1908. Capacity per diem, 2,000 tons.

Output in 1908 (four months), 12,648 tons; in 1909, 231,731 tons; in 1910, 357,205 tons.

PRICE per Ton (Wholesale).

| At— | Dol. c. | £ s. d. |
|---|---|---|
| Tientsin .... .... .... .... .... | 10 50 | 0 18 4 |
| Hankow .... .... .... .... .... | 10 50 | 0 18 4 |
| | Taels c. | |
| Shanghai.... .... .... .... .... | 9 75 | 1 4 4 |

Quality—Hard anthracite; excellent steaming and household coal.

Head office in London—Peking Syndicate, Limited, 110, Cannon Street. In Tientsin—6, The Bund

(4) *Ching Ching (or Hsing) Collieries*, in Ch'ing Hsing Hsien, in Chihli (Shansi border); connected by rail with the Peking-Hankow line at Chengtingfu. Opened in 1903. Owned by Sino-German company and Chinese Government. Daily capacity 1,000 tons.

Output in 1910, 150,000 tons. Modern machinery. German engineers.

Price at Tientsin (wholesale), 7 dol. 50 c. (13*s.* 1*d.*) per ton.

Quality—Bituminous.

Head office at Tientsin.

(5) *Pao Chin Collieries*, in Ping'ting'chou, Eastern Shansi; connected by rail with Peking-Hankow line at Chengtingfu. Opened several years. Owned by Pao Chin Mining Company, of Shansi (Chinese).

Capacity per diem—No particulars.

Output—No particulars.

Price at Tientsin 11 dol. 75 c. (1*l.* 0*s.* 6*d.*) for lump coal per ton.

Quality—Anthracite.

Agents in Tientsin—A. Walte and Co. In Shanghai—H. Reuter, 28, The Bund.

(6) *Mentikou mines*, Western Hills, near Peking, Chihli province. Owned by Anglo-Chinese syndicate; managed by Messrs. Doney and Co., of Tientsin.

Development hampered by dispute as to ownership and flooding of shafts.

Output in June and July, 1910, 50 tons per diem.

Quality—Anthracite.

Price at Peking, 6 taels (15*s.*) per ton.

(7) *To Li mines*, west of Chang Hsien, on Peking-Hankow Railway, 15 miles south-west of Peking. Owned by a Chinese syndicate, which is constructing an overhead railway from the mines to station at Chang-sin-tien. This line is at present transporting 200 tons per diem and, when completed, will be able to carry 1,000 tons per diem.

Quality—Anthracite.

Price at Peking, 7.83 taels (19*s.* 7*d.*) per ton.

(8) *Lin Sheng mines*, 11 miles by branch line from Ya-kou-ying, on Peking-Hankow Railway, near Peking. Chinese company; French manager. Modern mining machinery.

Output 500 tons per day which will be increased to 800 tons when underground pumping plant, now in course of erection, clears shafts of water.

Quality—Bituminous.

Price at Peking, 6 dol. 50 c. (11*s.* 4*d*) per ton.

(9) *Liu Ho Kou mine*, on light railway, 15 miles west of Feng Lo Chen, on Peking-Hankow line, in Chihli province.

Output 200 to 250 tons per diem.

Quality—Bituminous, soft, with 80 per cent. dust.

Price at Peking, 8 dol. (14*s.*) per ton.

(10) *Fushun collieries*, Fushun, near Mukden, in Manchuria; connected by rail with Suchiatun (34½ miles), on South Manchurian Railway. Owned and managed by the South Manchurian Railway Company from April 1, 1907.

Estimated output 3,000 tons per diem. Production in 1908, 383,612 tons; 1909, 393,630 tons; 1910, 830,328 tons.

WHOLESALE PRICES.

| At— | Lump. Yen | s. d. | Unscreened. Yen | s. d. | Dust. Yen | s. d. |
|---|---|---|---|---|---|---|
| Dalny..... | 8 | 16 0 | 7 | 14 0 | 6 | 12 0 |
| | Taels c. | | Taels. c. | | Taels. c. | |
| Shanghai..... | 6 80 | 17 0 | 6 20 | 15 5 | 5 50 | 13 9 |

Quality—Bituminous. Described by the company as the "best steaming coal in the Far East," but His Majesty's Consul at Dairen (trade report for 1909) says: "Fushun coal, owing to its combustibility is not in great demand as bunker coal. It is better adapted for household and industrial use, and in this respect is said to be superior to Japanese coal".

Head office—South Manchurian Railway Company (Mining Department), Dalny, Dairen. Agents—Mitsui and Co.

(11) The *Pinghsiang mines*, at Pinghsiang, in Kiangsi province; connected by rail (64 miles) with Chuchow, on the Hsiang River, 294 miles by water from Hankow. (Changsha).

Opened in 1898; owned by the Han Yeh Ping Iron and Coal Company (Chinese), under German supervision.

Average daily output up to July, 1909, 1,500 tons; from July, 1909, and at present, 2,000 tons.

Output in 1909, 520,000 tons; in 1910, 610,000 tons.

PRICE (Wholesale) at Hankow.

| | Per ton Delivered. Taels c. | £ s. d. |
|---|---|---|
| Coal— | | |
| No. 1 .... .... .... .... | 7 50 | 0 18 9 |
| ,, 2 .... .... .... .... | 7 0 | 0 17 6 |
| ,, 3 .... .... .... .... | 6 0 | 0 15 0 |
| Coke— | Dol. c. | |
| No. 1 .... .... .... .... | 16 0 | 1 8 |
| ,, 2 .... .... .... .... | 14 0 | 1 4 6 |

Quality—Bituminous, good steaming coal; coke "equal to best Durham".

The year 1910 was the best the mines have ever had the sales being very large.

(12) *The Shantung Mining Company's collieries*, at Fangtze, in Weihsien district, 102 miles from seaport of Tsingtau, and Hungshan, in Poshan district, 168 miles from Tsingtau; both mines connected by rail with that port. Owned and managed by a German company, the Schantung Bergbau Gesellschaft. Opened in 1902.

The total output of the Fangtze mines was in 1909, 272,000 tons; in 1910, 230,064 tons. Of the Hungshan mines, 1909, 160,000 tons; 1910, 252,816 tons.

WHOLESALE Prices per Ton.

| At— | Weihsien. Dol. c. | s. d. | Hungshan. Dol. c. | £ s. d. |
|---|---|---|---|---|
| Tsingtau.... | 7 0 to 9 0 | 12 8 to 15 9 | 11 50 to 15 50 | 1 0 0 to 1 7 0 |

| | Taels c. | | Taels c. | |
|---|---|---|---|---|
| Shanghai— | | | | |
| Lumps..... | 6 0* | 15 0 | 8 25 | 1 7 |
| Navy lumps | .... | .... | 11 0 | 1 7 6 |
| Nuts..... | .... | .... | 6 0 to 7 0 to 8 0 | 0 15 0 to 0 17 to 1 0 0 |

* Weihsien (Fangtze).

Quality—Both coals are bituminous, Fangtze being of inferior quality to Hungshan. The latter, which is used by the German cruiser squadron in China, has been described as "excellent steaming coal, similar to Cardiff," but, according to other reports, it is not a satisfactory steaming coal, being both dusty and dirty.

The Company's mines employ 77 Europeans and 5,800 Chinese.

NOTE.—The Chinese-owned mines in the Poshan Valley are said to have produced 250,000 tons in 1910.

(13) *The Chung Hsing collieries*, at Tsaochwang, in the I Hsien district, Southern Shantung; owned and managed by a Sino-German company. A railway from the mines to Taierhchwang, on Grand Canal, 35 miles, is under construction, and a complete set of mining machinery has recently been imported from Germany. The present output of coal is estimated at 300 tons per diem. Particulars as regards quality and price not available.

(14) *The Lung Wang Tung mines*, near Chungking, in Ssuchuan province; formerly owned by the Kiang Pei Ting Mining Company (British), now handed over to the Chiang Ho Mining Company (Chinese) and worked by native methods. [Chungking.]

Quality—Bituminous, good steaming coal.

Price 2.50 to 3 taels (6*s.* 3*d.* to 7*s.* 6*d.*) per ton at pit's mouth.

(15) *The Kueichow mines*, at Siangki, 30 miles from the Yangtze and 80 miles above Ichang, in Hupei province. The mines, connected with Yangtze by small navigable streams, are on line of projected Chuan-Han Railway. Worked by native methods.

Estimated output 400 tons per mensem.

Quality—"A clear burning bituminous coal, in calorific value said to equal 60 per cent. of Welsh coal." [Ichang.]

(16) Government collieries, Hohsien, Kuangsi province. Supplied with German machinery, 1910. [Wuchow.]

## IRON

(1) *The Tayeh iron mines*, at Tieh-shan-pu, 17 miles by light railway from Huang-shih kang, on the Yangtze, 70 miles below Hankow, in Hupei province. Owned and managed by the Han Yeh Ping Iron and Coal Company, Limited (Chinese).

Described as "one of the richest iron mines in the world." "Ore exposed on surface . . . estimated at 500,000,000 tons." Under Japanese supervision; men employed 3,000.

Output in 1909: Magnetic ore, 306,000 tons; manganese ore, 1,500 tons.*

(2) *The Tung Kuan Shan mines*, in the Tungling district, on the Yangtze, 55 miles above Wuhu, in Anhui province

A concession to work these mines, granted to the London and China Syndicate (British) in 1905, was surrendered in 1910 and a Chinese company is now being formed for the purpose. [Wuhu.]

## COPPER.

(1) Government smelting works at Yaokai, 70 miles west of Lanchow, in Kansu province, have recently been established to deal with copper ore mined in Tsingyuan district. Machinery of American and British make; latter now in course of erection. Works in charge of British engineer, who has four Belgian and Spanish assistants. Plant said to be capable of turning out 4 tons of copper in 24 hours from 7½ per cent. of ores.

A modern gold milling plant (British) has been erected at the same place, but work is suspended pending the arrival of a tubular boiler and pump ordered in Germany.

(2) *Government mines, at Ch'ang Pailing*, Kanchow prefecture of Kiangsi province. Have

* Figures for 1910 are not available.

been worked for many years by native methods. Inspected by German engineer in 1908, who reported very favourably both as to quantity and quality of ore. Samples were obtained containing as much as 40 per cent. of copper. [Kiukiang].

A copy of the engineer's report will be furnished on application to His Majesty's Commercial Attaché, Peking.

(3) *Government mines, at Pai Shui Ho* Penghsien district, Ssuchuan province. [Chengtu.]

Three Japanese assayists engaged and a smelting furnace purchased, September, 1910.

(4) *Government mines, in Huilichow*, Ningyuan prefecture, Ssuchuan province. [Chengtu].

Red and white copper, worked by native methods. These mines are the chief source of supply for the province of Ssuchuan.

Price of red copper slabs at Chengtu, 0.38, taels (11*d.*) per catty (1⅓ lbs.); white copper, 0.70 taels (1s.9*d.*) per catty.

OTHER MINERALS.

*Silver.*—San Ch'a mines, near Kuei Hsien, Kuangsi province. Foreign machinery; Chinese management. A failure owing to bad management. [Wuchow].

*Quicksilver.*—The cinnabar mines, at Yuan Shan Chiang, 15 miles from Lung Chi Kow, in Kueichow province. [Yunnan.]

A concession to work these mines was acquired by a syndicate called the Anglo-French Quicksilver and Mining Concession (Kueichow province) of China, Limited, in 1898, but owing to difficulties with the Chinese authorities little progress has been made with the development of the properties, which include iron smelting works at Tsingki, Eastern Kueichow, and various mining rights in the same province.

Samples of the Yuan-shan-chiang ore assayed by an expert give a maximum of 4.4 per cent. mercury and a minimum of 1.7 per cent.; average of assays 2.78 per cent. mercury.

Average estimated daily output of mines, 150 tons (of 2,204 lbs.).

London office of company—54, New Broad Street, E.C.

*Tin.*—(1) The Kochiu mines, 30 miles from Mengtzu, Yunnan province. Worked by native methods; 30,000 men employed; 4,216 tons, valued at 512,968*l.*, exported in 1909.

A blast furnace for these mines, purchased in Germany, arrived at Haiphong in January, 1911.

NOTE.—The above mines were included in a concession granted to the Yunnan Syndicate, Limited.

The syndicate, in 1907, transferred their mining rights in the district of Lingan (in which the Kochiu mines are situated) to a French company entitled Société d'Exploitation de Ling Ngan. Owing to local obstruction the company has, so far, been unable to make any progress with the development of the mines [Yunnan.]

(2) Ho Yuan mines (Chinese), in Kuangsi province, near Wuchow. [Wuchow.]

(3) Niutsongling mines, near Nodoa (Tamchow department of Hainan). Owned by the Singapore Merchants Pioneer Company Limited, formed in 1908.

"A fairly rich stanniferous lode has been struck, the ore from which is expected to average 60 per cent. per ton." [Kiungchow]

*Antimony.*—(1) Pao Hua Company's mines (Chinese), in Kuangnan and Kaihua (Western Yunnan). Permit to work granted 1909. [Yunnan.]

(2) Szecheng mines, at Szecheng, in Western Kuangsi. Ore sent to refining works established at Wuchow in 1908. Distance of mines from works and cost of transport have hitherto rendered undertaking a failure. [Wuchow.]

(3) The Hunan mines, in three districts of Hunan province:—(1) Central: Changteh, Anhua, Sinhua, Paoking and Changsha; (2) Southern: Hengchow, Yungchow and Chenchow; (3) Western: Yungshun, Fenghwang, Yuanchow and Shenchow.

"The ore produced in the vicinity of Sinhua and Anhua is the richest, attaining a fineness of over 70 per cent. of stibnite."

The Hua Chang Antimony Company, of Changsha, have begun to refine antimony by scientific methods, and in the same place the Imperial Smelting Works are in course of erection.

# FAR EASTERN RAILWAY NEWS

MANILA RAILROAD CO. INCORPORATES.—Articles of incorporation have been filed with the Bureau of Archives, Philippine Islands, by the Manila Railroad Company, Horace L. Higgins, President and General Manager. The capital is fixed at £4,000,000, of which £2,339,340 is paid up. This company is active expanding its lines throughout Luzon and when present proposed construction is completed the system will comprise over 800 miles. The incorporation under the local corporation law was decided upon as convenient in view of the Philippine Government guarantee of interest of bonds for construction of the Southern Luzon lines.

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ROYAL RAILWAYS OF SIAM.—Construction on the southern line has progressed on the Trang Tung Section to Kilometer 70 and from Petchaburi the railhead is at kilometer 86 according to the Bangkok Times.

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KOREAN CONSTRUCTION.—According to the Seoul press the program first proposed to extend over a period of eleven years will be finished in seven.

*Seoul-Wonsan Line.*—Work on the Seoul-Wonsan line has made great progress. The construction work on the 20-mile section between Yonsan and Euichongpu was completed September, 1911. It opened to public traffic, with five stations, at Hankang, Tukto, Chongyangli, Changdong, and Euichongpu: Work has also been commenced at Wonsan. Surveying of the route has been progressing and a construction office established at Wonsan. The 30-mile section between Wonsan and Sinyongchiwon is expected to be completed and open to traffic by March, 1913, and that between Euichongpu and Pyongkang, extending over 55 miles, will also be finished at the same time. There will then be only the 35 mile section between Pyongkang and Sinyongchiwon still unfinished. This portion is, however, the most difficult section to work, as it will be laid over a mountainous locality, with rapid streams running through it. In consequence, many bridges and tunnels must be built before the railway is laid. This section will be com-

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The export of Antimony from Changsha in 1909 was: Regulus, 4,800 cwts.; crude, 110,825 cwts.; ore, 22,013 cwts.

NOTE.—The districts above referred to also produce iron, lead, zinc, tin, copper, sulphur, realgar and manganese. [Changsha.]

*Orpiment* (arsenic trisulphide) is obtained rom mines near Chaochow and Menghua, in the Tali prefecture of Yunnan province [Tengyueh.]

Export through the Imperial Maritime Customs at Tengyueh in 1909, 8,764 cwts., valued at 8,627*l.*, sent principally to Burmah.

*Petroleum oil* is found in many places between Suitechow and Yenchang, in Eastern Shensi. At Yenchang are oil wells worked with rudimentary machinery under Japanese supervision. A Chinese company at Hsianfu has obtained a concession to develop these wells, and a large plant of machinery, purchased in Germany, recently arrived at Hankow and is now on its way to the wells, [Hankow.]

*General. Yunnan.*—An Anglo-French company called the Syndicat du Yunnan, Limited, holds a concession from the Chinese Government, dated June 21, 1902, to exploit the mineral deposits in the prefectures of Yunnan-fu, Ch'eng-chiang fu, Lui-an-fu, Kaihua fu, Chou-hsiang-fu, and the departments of Yuan-chiang-chow and Yung-pei-ting. These deposits are stated in the concession agreement to consist of copper, gold, silver, coal, iron, platinum, nickel, tin, petroleum, cinnabar and precious stones.

Owing to the opposition of the local gentry and officials the company have, so far, been unable to proceed with the development of their concession. [Yunnan Fu.]

APPENDIX 1.

The following is a list of the minerals known to exist in the 18 provinces of China, Manchuria and Turkestan, their principal places of production and the name of the nearest British Consulate being given in brackets:—

(*a*) Kansu province.—Coal (Kungch'angfu); iron, gold, silver, copper (Yaokai); petroleum. [Hankow.]

(*b*) Shensi province.—Coal and iron (Sianfu); salt, gold, nickel, magnetite, marble and porphyry, petroleum (Yenchang). [Hankow].

(*c*) Shansi province.—Coal and iron (Taiyuanfu, Pingtingchow, Tsechow); salt. [Tientsin].

(*d*) Honan Province.—Coal and iron (Tsinghuachen, Lushanhsien and Juchow); tin and argentiferous lead ore. [Hankow].

(*e*) Chihli province.—Coal (Western Hills, Peking, Kaiping, Lanchow, &c.) kaolin and sandstone, gold (Jehol). [Tientsin.]

(*f*) Shantung province.—Coal (Weihsien; Poshan and Ichowfu); iron (Kiulingchen), copper; argentiferous lead ore, gold (Chaoyuan, Pingtu and Weihaiwei); diamonds, gypsum, clay and sandstone. [Tsinan.]

(*g*) Szechuen province.—Salt (Tzulinching, Chiating and Paoning); coal and iron (Kuanhsien, Weiyuan, Chienwei, Ch'ichiang, Pahsien. Chiangpeiting); copper( Ningyun); white copper (Huilichow); silver, gold, petroleum (Pahsien and Wanhsien); lead, antimony, sulphur-saltpetre, gypsum, jade. [Chengtu.]

(*h*) Hupeh province.—Coal (K'ueichow, Wuchang, Hsiangyangfu); iron and zinc, gypsum (Yingcheng); copper (Chienshih). [Ichang.]

(*i*) Hunan province.—Coal (Hsiangtan and valley of Hsiang River); gold (Huitung (Mopin)); silver, iron (Anhua and Paoking); copper, lead (Changning and Chiyang); zinc, antimony (Anhua, Sinhua, Shaoyang and Shenchow); sulphur (Tzuli); realgar. [Changsha.]

(*j*) Kiangsi province.—Coal (Pinghsiang and Lohpinghsien); kaolin, copper (Kanchow). [Kiukiang.]

(*k*) Anhuei province —Coal (Ningkuofu and Chihchow); iron (Hoshan); copper (Tungkuanshan); lead. [Wuhu.]

(*l*) Kiangsu province.—Coal, iron, marble, plumbago (Kaotze, Chinkiang). [Nanking.]

(*m*) Yunnan province —Copper (Tungchuan and Chaotungfu); zinc, lead, tin (Kochiu), orpiment, coal (Talifu); salt, gold, gypsum, jade. [Yunnanfu.]

(*n*) Kueichow province.—Quicksilver (Pehmatung, Wuchuanhsien, Hsingifu); iron, coal, copper, zinc, sulphur, marble. [Yunnanfu.]

(*o*) Kwangsi province.—Antimony (Szecheng); coal (Hohsien, Nanning, and Yungan); gold, silver, iron (Kuanyang); lead (Fuchwan) [Wuchow.]

(*p*) Kuangtung province.—Coal (Shaochoufu, Huahsien); iron, copper, lead, silver, tin, gold (Ch'inchow). [Canton and Amoy.]

(*q*) Fukien province.—Coal, lead, tin, gold, silver, iron (Kutien). [Foochow.]

(*r*) Chekiang province.—Coal (Chuchowfu); lime, gypsum, alum (Pingyang) building stone. [Hangchow and Ningpo.]

(*s*) Manchuria.—Gold (valley of Amur River); coal (Liaoyang, Fushun, Yentai); iron (Tiehling); silver, copper lead, asbestos, soda. [Mukden. Harbin and Dairen.]

(*t*) Sinkiang (new dominion or Chinese Turkestan).—Gold, lead, coal (Turfan); sulphur, saltpetre, alum, petroleum, jade.

APPENDIX 2.

EXPORT of Minerals to Foreign Countries and Original Export from each Customs District during the Year 1909.

| | To Foreign Countries. | | From Customs District. | |
|---|---|---|---|---|
| Antimony— | Tons. | £ | Tons. | £ |
| Regulus and refined .. | 7,812 | 91,303 | 6,775 | 79,[illegible] |
| Ore .. .. .. .. | 764 | 4,351 | 3,217 | 18,[illegible] |
| Iron— | | | | |
| Pig and manufactured .. | 38,104 | 121,414 | 76,206 | 278,[illegible] |
| Ore .. .. .. .. | 87,701 | 25,812 | 87,730 | 25,8[illegible] |
| Lead .. .. .. .. | 12 | 134 | 264 | 8,110 |
| " ore .. .. .. | 3,975 | 12,309 | 3,787 | 11,640 |
| Quicksilver .. .. .. | 50 | 9,528 | 68 | 12,[illegible] |
| Tin, in slabs .. .. .. | 4,445 | 537,171 | 4,496 | 540,[illegible] |
| Zinc .. .. .. .. | 239 | 2,988 | 238 | 2,98[illegible] |
| " ore .. .. .. | 7,459 | 9,485 | 7,028 | 10,[illegible] |
| Coal .. .. .. .. | 195,950 | 142,076 | 1,107,804 | 771,66[illegible] |
| Total .. .. | | 956,571 | | 1,861,02[illegible] |

pleted by the autumn of 1914. It may be added that the work on this line is being undertaken with a view to making it a permanent one. In consequence, no reconstruction work is expected to be needed. On the other hand, the construction expenses are much higher than those for the Honam Railway, being about 75,000 yen ($37,350) per mile, while those for the latter are only about 25,000 yen ($12,450) for a similar distance.

*The Honam Line.*—On the section between Taichon and Yongsan, a distance of 20 miles, the embankments and the laying of the track are completed. Construction cars are already running on it. The 37-mile section between Taichon and Kangkyong was completed in October, and the opening ceremony celebrated on the Emperor's birthday, November 3. Four stations, Kasuwon, Tukei, Yonsan, and Lonsan are established. The section from Kangkyong to Kunsan is to be finished during March, 1912, which will result in actually connecting Seoul and Kunsan by railroad. The construction work on the line is to be begun simultaneously from both termini. The section between Mokpo and Laju, a distance of 35 miles, and that between Li-li and Chyongeup near Taichon will be open to traffic during March, 1913. The 45-mile section between Chyongeup and Laju, which is the last section of the Honam line, will be finished in March, 1914.

*Reconstruction of Seoul-Wiju Line.*—The reconstruction of the Seoul-Wiju line, which was commenced in 1909, has since made much progress. The greater part of the work has already been completed; tunneling in the section between Ko-song and Hanpo, a distance of 23 miles, and the reconstruction work between Yang-chaik and Tong-im, 21 miles, are all that remain unfinished. The whole line will be completed by July, 1912. Then the gradient will be less than 1 per cent throughout the line, which will allow the use of large locomotives of 100 tons now employed on the Seoul-Fusan route. The time required for covering the Seoul-Wiju line has already been shortened by two hours and a saving of two hours more will be effected upon the completion of the reconstruction of the line.

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FRENCH INDO-CHINA RAILWAYS—Out of a proposed loan for francs 100,000,000 recommended by the Governor General fcs. 60,000,000 will be spent in the construction of lines uniting Pnom-penh and Battambang, Mytho and Cantho, Vinh and Kwang-tri, and Nhatrang and Saigon.

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THE SHANGHAI-NANKING RAILWAY—According to General Manager Pope the revolution has boomed business on this line. Covering one week of traffic business increased from $12,000 Mex, the best previous record, to $64,000. The earnings of the train mile increased from $3.50 to $5.00.

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NEW SOUTH WALES RAILWAYS—The government proposes the expenditure of £8,000,000 in railways and other public works in addition to the present extensive system with a view to opening up rich agricultural territory. The earnings of the railways for 1911 amounted to $36,050,059 with operating expenses $23,529,528, or over 65% of earnings. The surplus after meeting interest charges was $9,592,845. There were 3,800 miles open for traffic representing a total capital account of $248,054,751.

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THE CHINESE EASTERN RAILWAY—The fiscal year 1910 shows a marked improvement by the company. The deficits of Roubles 3 700,000 in 1908 and 700,000 in 1909 have been changed to a profit of Roubles, 1,300,000 in 1910. The gross receipts were Roubles 17,300,000 and gross expenditure Roubles 16,000,000 for the year.

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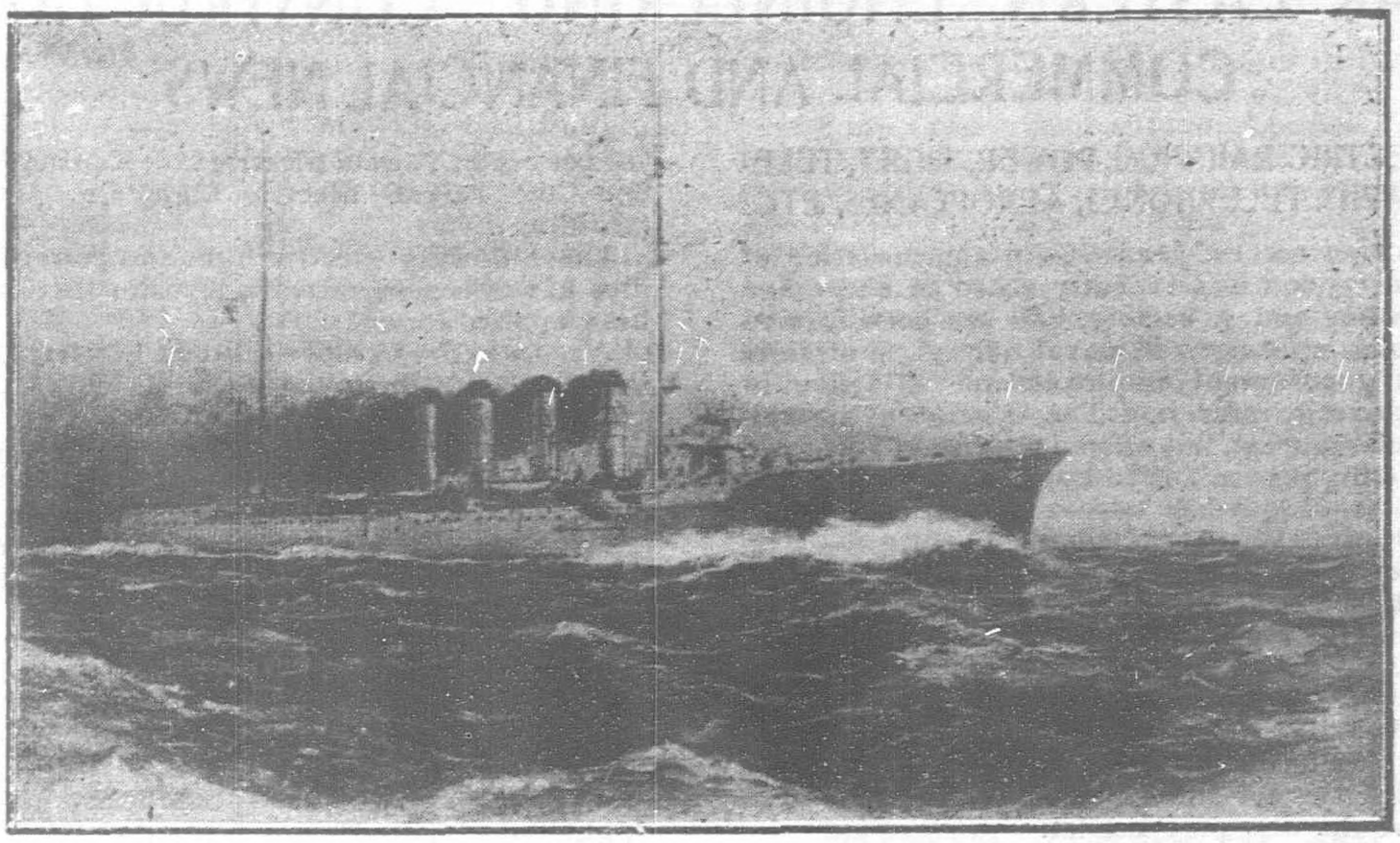
THE ANTUNG MUKDEN RAILWAY—This railway was opened to traffic on October 30, the occasion also celebrating the completion of the Yalu railway bridge. This line, which is the last link completing an all Japanese connection from Tokyo to Mukden, is 170 miles long. The total distance from Tokyo via Shimonoseki and Fusan to Mukden is approximately 1,582 miles, while via Dairen it is 1711 miles making the new through route via Korea about 30 hours shorter at less outlay. The Yalu Bridge is 3,097 feet in length and its construction began in 1908.



THE JAPANESE CRUISER YAHAGI

The Yahagi, a protected cruiser, second class, built at the Mitsui Bishi Dock Yards and Engineering Works, Nagasaki, for the Japanese Navy, was launched October 3 with impressive ceremony. Prince Takada of the Imperial family was present.

The keel of the Yahagi was laid on April 6, 1910, and previous to launching the engines, boilers, and funnels were installed, making in all 18 months on the stocks. Her two sister ships the Chicuma and Hirado were launched recently from the Sasebo and Kawasaki dockyards respectively. Following are the dimensions:

| | |
|---|---|
| Length | 475. feet. |
| Breadth | 46.6 " |
| Depth | 28.6 " |
| Drought | 16.7 " |
| Displacement | 5,000 tons |
| Horse-power | 25,000 |
| Speed | 26 knots |

Engines—Parson's Steam Turbine.

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PROPOSED KEDAH RAILWAY.—The sum of $1,400,000 annually will be appropriated in 1912 and 1913 for the construction of a line through the Province of Wellesley, Kedah and Perlis.

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JAPANESE IMPERIAL RAILWAYS—The net earnings of the lines for the year are expected to exceed the estimates by yen 3,000,000 making in all yen 11,000,000. These profits will be utilized for expansion in construction.

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F. M. S. RAILWAYS.—The railway department proposes expending $5,000,000, Straits Cur., on new construction work in 1912. The extension of the Pahang-Kalantan line towards Kedah and the completion of the deviation of the main line to Salak South are the most important works. A line to the Rawang Coal field may also be considered. It is also proposed to expend $447.888 in the purchase of seven locomotives, 100 freight cars and additional passenger coaches.

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PERSONAL.—Alex Strausz jr., formerly auditor of the Philippine Railway Co. who recently returned to the United States, has accepted the position of auditor with the Pierce Syndicate that has large holdings in Mexico, including the electric railway of Mexico City.

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NEW RECORD MADE BY SILK TRAIN.—The silk train over the Great Northern line, carrying the cargo of silk and silk goods of the Nippon Yusen Kaisha's American line "Inaba Maru" that sailed from Yokohama September 27, made the coast to coast journey in 81 hours 50 minutes, lowering all previous records by sixteen hours. A dispatch from St. Paul under date of October 18 says:

"All running records between Seattle and New York were smashed by the $1,000,000 silk train which passed through St. Paul early Sunday morning. Advices received at the Great Northern general offices are that the train arrived in New York at 5:35 P. M. Monday the 17th, making the coast-to-coast journey in 81 hours and 50 minutes.

"The best time made by a silk train, starting over the Great Northern, previously, was 102 hours and 5 minutes, a year ago. The Chicago, Milwaukee & St. Paul last winter made the run in 97 hours and 40 minutes.

"The record of the silk train beats that made by the fast mail of the Great Northern, which makes the journey from St. Paul to Seattle in 48 hours. The actual running time from Seattle, made by the silk train of five cars, was 45 hours and 16 minutes. It left Seattle at 3:45 o'clock Friday morning, arriving in St. Paul at 4:01 Sunday morning.

"Nineteen minutes were consumed in switching and inspecting the cars at St. Paul transferring them to the Burlington. The run from St. Paul to Chicago was made in 9 hours and 44 minutes. The records show that 41 minutes were spent in getting the train through Chicago. The Lake Shore carried the train through from Chicago to New York in 26 hours and 50 minutes.

"The average speed between Seattle and St. Paul was 40.1 miles per hour for 1,814 miles, over two mountain ranges."

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MANILA RAILWAY CO.—The report for the year 1910 shows 217 miles in operation and the gross receipts $2,377,603, an increase of $330,500 over the previous year. The operating expenses were $947.706, an increase of $48,000; the net revenue was $1.428.897, an increase of $282,000. The ratio of working expense to revenue was 40% against 44% in 1909.

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TYER'S SIGNAL EQUIPMENT IN SOUTH AFRICA.—According to the Railway Gazette, the South African Railways have placed an order with Messrs. Tyer & Co., Ltd, which is now approaching completion, for a large number of their single line tablet machines for working the section of the railway between Randfontein and Fourteen Streams Railway. These machines are a combination of absolute block-working and permissive-working, the latter in times of seasonal traffic enable nearly 40 trains to be sent consecutively in safety in one direction. The order also includes a number of crossing instruments, which allow two or more trains to cross at an intermediate point in a block section.

# FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

## ELECTRIC RAILWAYS, POWER, LIGHT, TELEGRAPHS, TELEPHONES, AEROPLANES, ETC.

AVIATION IN JAPAN.—An appropriation of Yen 375,000 was recently voted to encourage aviation and a society has has been formed among military and naval officers, professors and government employes, and is active in furthering interest. The *Kokumin*, a semi-official journal, has offered a purse of Yen 5,000 for a flight over Tokyo Bay.

PACIFIC WIRELESS RECORD BROKEN.—Messages from a Japanese wireless station on Hokushu Islands was reported received in San Francisco on October 6 and messages exchanged a distance of 6,000 miles.

MANILA ELECTRIC RAILROAD EXTENSION.—Plans have been submitted to the municipal authorities for the extension of the system to serve the new port district.

EASTERN EXTENSION TELEGRAPH COMPANY.—The Eastern Extension, Australasia, and China Telegraph Company report for the half-year ended June 30, 1911, that the gross receipts amounted to £329,709, against £344,960 for the corresponding half-year of 1910. The working expenses, including £18,973 for maintenance of cables, absorb £151,618 against £152,407 for the corresponding period of 1910, leaving a balance of £178,091. From this is deducted £2,942 for income-tax payable in England, £15,048 for interest on debenture stock, and £11,020 for Coronation bonus to staff and other extraordinary expenses, leaving £149,080 as the net profit for the half-year. After adding £27,617 brought forward from the previous half-year, there is an available balance of £176,698. Two quarterly interim dividends of 1¼ per cent. each, amounting to £75,000 having been paid for the half-year leaving a balance of £101,698, of which £50,000 has been transferred to the general reserve fund, and the balance of £51,698 carried forward.

THE EASTERN TELEGRAPH COMPANY, LIMITED—The report of the directors for the half-year ended June 30, 1911, states that the revenue amounted to £67,396 13s. 6d. from which are deducted £232,755 12s. 8d. for the ordinary expenses, and £58,602 18s. 7d. for expenditure relating to maintenance of cables, sundry differences in exchange, and income tax payable abroad, leaving a balance of £381,038 2s. 3d., to which is added £23,762 9s. 10d. brought from the preceding account, making a total available balance of £404.800 12s. 1d.

After providing for income tax, interest on mortgage debenture stock, and for two quarterly dividends on the preference stock, which in all absorb £81,260 3s. 10d., there remains a balance of £323,540 8s. 3d., out of which the directors have distributed a bonus to the staff in colebration of the Coronation of King George V. costing £24,492 4s. 2d., and have placed £150,000 to the general reserve fund, and have allocated £100,000 to meet the two interim dividends of 1¼ per cent. each on the ordinary stock, the balance of £49,048 4s. 1d. being carried forward to the next account.

KYUSHU ELECTRIC RAILWAYS AND LIGHT COMPANIES.—The following is the result of operations of companies giving capital and rate of dividend: Kumamoto Electric Co., $62,000 (10 per cent); Kurume Electric Light Co., $68,000 (10 per cent); Kyushu Electric Co., $477,000 (7 per cent); M yakonojo Electric Co., $52,000 (5 per cent); Nagasaki Electric Light Co., $100,000 (6½ per cent); Naokata Electric Light Co., $53 000 (8 per cent); Nakatsu Electric Co , $50,000; Oshima Electric Co., $6 000; Saiki Electric Co., $22,000; Saseho Electric Light Co., $3,000,000 (15 per cent); Shimabara Hydroelectric Co., $36,000 (7 per cent); Takeda Hydroelectric Co., $15,000 (10 per cent); Usuki Electric Co., $20,000; Wakamatsu Electric Light Co , $50,000 (15 per cent); Yawata Electric Co.; Kanada Electric Co.; Taikan Electric Light Co., $15,000 (building).

The following electric light and power comnies have been organized in Kyushu district and have applied for charters:

*Nagasaki Prefecture*.—Hirado Electric Light Co., Sonogi Electric Light Co., Keichiku Electric Light Co., Mogi Electric Light Co.

*Oita Prefecture*.—Mori Electric Co , Tsusu Electric Co., Kamaye Electric Co., Kokuto Electric Co., Inukai Electric Co.

*Miyazaki Prefecture*.—Kirishima Hidroelectric Co., Aburatsu Electric Co., Minami Kyushu Electric Co.

*Kagoshima Prefecture*.—Sendai Electric Co., Kajiki Electric Co. Demizu Electric Co., Shifushi Electric Co., Makurasaki Electric Co.

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*Kumamoto Prefecture*.—Ushibuka Electric Light Co., Hondo Electric Light Co., Hitoyoshi Electric Light Co.

*Fukuoka Prefecture*.—Moji Electric Co., Yashima Electric Light Co., Tsuyasaki Electric Co., Fukuoka Electric Light Co., Itoshima Electric Light Co , Mayebara Electric Light Co., Fukushima Branch, Kyushu Electric Co., Orio Electric Light Co.

ELECTRIC INSTALLATION FOR CUBA.—The Cuban American Sugar Company, New York City, has ordered 3 1000 Kw. three-phase turbo generators, 1 motor generator exciter set, and a switchboard from the General Electric Company.

Mr. Gano Dunn has just returned to New York from abroad, where, as a representative of the United States Government, and as President of the American Institute of Electrical Engineers, he has been attending the International Electrical Congress at Turin and the meeting of the International Electro-Technical Commission, the body that has been organized to bring about international uniformity of standards and practice in the electrical industry.

Mr. Dunn, who for many years was First Vice-President and Chief Engineer of the Crocker Wheeler Company, and is a past President of the New York Electrical Society, has been elected a Director and a Vice-President of J. G. White & Company, Inc.

Mr. D. Sterrett Pindell, B. A., E. E., has been added to the staff of the engineering and construction firm of C. G. Young, 60 Wall Street, New York City.

Mr. Pindell has had valuable experience in a wide range of engineering, construction and operation of public service utilities throughout the United States and Canada, including steam and electric railways, electric lighting, hydroelectric power development, building construction, etc. His present activities will be especially in connection with examinations and reports for which the firm of C. G. Young has a high reputation—many large and important undertakings in this and foreign countries having been financed upon Mr. Young's recommendations.

## PUBLIC WORKS, DOCKS, WHARVES, BUILDINGS, ETC.

HONGKONG HARBOR REFUGE.—The Director of Public Works reported to the Legislature that at the end of three years less than $1,000,000 had been expended in this work although the estimates called for an expenditure of $2,300,000 in five years. This work is to be pressed.

A MILLION FOR MORO PROVINCE PUBLIC WORKS.—Estimates on over 50 projects including extensive roads, public buildings, wharves, etc , have been prepared that will represent an outlay for the year of ₱1,000,000.

CEBU WATER SYSTEM.—The new gravity system costing ₱1,550,000 now being installed by the Atlantic Gulf & Pacific Co. will be completed by the end of the year. The water is taken from the Labangan River. The system includes a 333 000 000 gallon reservoir and a distributing tank with a capacity of 4,000,000 gals.

SPECIAL PHILIPPINE PUBLIC WORKS FUNDS.—The legislature has provided for the loan of half the gold standard fund to the provinces and municipalities for public works. This makes ₱7,000,000 available in addition to the regular appropriations for insular works.

A POWERFUL BRITISH DREDGER FOR PANAMA.—Messrs. Wm. Simons & Co., Limited, Renfrew, launched on the 12th September last an extremely powerful bucket hopper dredger which they have built to the order of the United States Government for carrying out some of the most arduous under-water cutting to be done in connection with the Panama Canal.

The dredger is of the t in-screw type and will make the voyage to the Pacific Coast under its own steam. The vessel has a hopper capacity for 1,200 tons of dredgings. The bucket ladder is designed for dredging up to a depth of 50 feet.

The vessel is propelled at a speed of 10 knots per hour by two sets of triple expansion surface condensing engines supplied with steam from two cylindrical multitubular boilers, constructed to Lloyd's requirements for a working pressure of 180 lbs, per square inch.

A complete outfit of the most modern auxiliary machinery is provided in the engine room including independent air pumps, circulating pumps, feed pumps, feed heater and filter, &c.

The dredging gear is of the most massive description and is arranged to give three speeds of bucket to suit the various kinds of material to be dealt with. The dredging gear can be driven by either of the main propelling engines.

Two sets of buckets are provided, one of 54 cubic feet capacity for dredging soft material, and one of 35 cubic feet capacity for dredging stiff clay. The bucket ladder is a steel girder of exceptional strength, and an idea of the enormous strength of the bucket chain may be conveyed by the statement that the ladder with its chain of buckets, links and pins, weighs upwards of 240 tons. The upper end of the bucket ladder is supported on an independent pivot shaft and the lower end is controlled by powerful steel wire rope tackle and independent steam hoist gear which is designed for raising the ladder at a speed of 10 feet per minute.

Steam manoeuvring winches are fitted at bow and stern, each driven by independent two-cylinder engines, and each barrel is fitted with friction clutch and brake to enable the mooring chains to work independently of each other, or simultaneously, as may be required.

Shoots are provided for loading into the vessel' own hopper, also overboard shoots controlled by independent steam winches for loading into barges alongside.

The hopper doors are controlled by independent hydraulic gear.

Steam steering gear, full electric light installation, and refrigerating plant, are provided, also cabins for officers, comfortable quarters for the crew, and the most modern equipment for a vessel of this class.

YOKOHAMA HARBOR WORKS.—Plans are completed to expend yen 1,240,000 in the enlargement and improvement of the pier at Yokohama. The plan is to increase the present width of 63 feet to 132; to dredge the harbour inside the breakwater so that steamers of the largest tonnage can be accommodated.

The present pier is merely a roadway. This will be improved by erecting 2 shed 450 feet long and 72 feet wide, having an upper waiting room for 1st class passengers, so they can disembark direct from the decks of the steamers.

PHILIPPINE HARBORS.—The following allotments have been made by the Secretary of Commerce and Police: construction of Iloilo River walls, ₱75,000; streets in new port of Manila ₱43,000; dredging Manila harbor ₱150,000.

KEELUNG HARBOR.—Work in this harbor has progressed steadily during the past year; 9 acres were dredged to a depth of 30 ft. and 2 acres to a depth of 27 ft., besides some shallower

areas. Quays.—720 feet of quay wall were completed during the year, having a height of 40 ft. and a depth alongside at low water of 30 ft. where steamers of 1,000 to 6,000 tons can be berthed; 900 ft. of quay wall, of a height of 17 ft. and having a depth alongside as low water of 12 ft., were added during the year, bringing the total length of this portion of the quay now completed up to 3,600 ft. Landing Facilities.—Six electric cranes of the kind known as the electric tower transporter, have been ordered from the United Kingdom. These are said to work very rapidly, and a feature of great importance at Keelung, where during the winter half-year the rain is almost continuous, is that the cargo can be worked under a movable covering which is attached to the crane. Electric capstans will be erected on the quays to move the cranes, which will run on rails.

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MANILA'S PUBLIC AQUARIUM.—This construction will be completed and opened January 1. It comprises a gallery of 29 tanks, and a main reservoir with a capacity of 50 000 gallons. An effort is being made to have a representative collection of the 1,200 species of fish known to exist in insular waters.

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FILIPINO Y. M. C. A. BUILDINGS.—The International Committee offered to contribute ₱110,000 and a ₱45,000 site towards a student association building and ₱120,000 towards a Y. M. C. A. building in Manila provided the city would raise ₱80,000. After a campaign of five days the amount was raised and plans for the buildings are under way. When completed the total investment in Y. M. C. A. buildings in Manila will reach approximately ₱800,000.

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## SHIPBUILDING, GENERAL MARINE AND FISHERIES

AMERICAN SHIPBUILDING ACTIVITY.—Anticipating the opening of the Panama Canal activity in shipbuilding is indicated by the extensive plans of several large companies. The Atlantic and Pacific Transportation Company recently organized and capitalizedat$15,000,000 plans the construction of fifteen ships. The American Hawaiian S. S. Co. have contracted with the Maryland Steel Company for four new ships with a cargo capacity of 9,000 tons each. The Standard Oil Co. is also considering the construction of several additional vessels for their fleet in addition to the two new tank ships on the ways.

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BLUE FUNNEL LINE.—This company announces that the new steamer Talthybius will replace the Oania on the Far Eastern run leaving Liverpool in February, 1912, and the Keeman will be superseded by a new steamer in October next. These steamers are to be approximately 10,000 tons each.

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DIRECT MANILA-SAN FRANCISCO LINE—An effort is being made by the commercial interests of the Philippines to interest capital in establishing direct connection with San Francisco. Captain Robert Dollar of the Dollar Steamship Company has been looking over the situation with a view to expanding in that direction if prospects are favorable.

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THE TRAWLING INDUSTRY.—The expansion of the trawling industry in the Far East following the success attained by trawling companies in Japan include the formation of Hongkong and South China Steam Fisheries, Ltd., the Shanghai Fisheries, Ltd., and the Philippine Fisheries Co., Manila. Operations at Hongkong and Manila have been in progress for some time. The trawlers are the most modern of their kind and their successful operation will no doubt encourage the formation of a large number of similar companies.

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GASOLINE CRAFT FOR PHILIPPINE LUMBER TRADE.—The gasoline schooner Eclipse arrived in Manila from Honolulu via Hongkong the latter part of November. It is a 211 ton vessel equipped with a Hercules three cylinder, 125 h. p. gasoline engine. She made the run to Hongkong under sail. The Eclipse is owned by the Insular Transportation Co.

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CRUDEOIL MOTOR BARGE FOR BANGKOK.—The successful trial trip of Messrs. Howarth Erskine, Ltd., new twin screw crude oil Dolinder motor barge is reported by the *Bangkok Times*. This vessel is 110 feet over all, beam 23 feet, and draft loaded, 7′ 8″, with a net cargo capacity of 300 tons. It is fitted with liquid fuel tanks having 700 gallons capacity and kerosene tanks of 100 gallons. On the outward trial trip kerosene was used and inward, liquid fuel, averaging 2½ gallons per hour either way with a speed average of 7.16 knots.

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SUBSIDY FOR PHILIPPINE COASTWISE SHIPPING—A bill has been introduced in the legislature authorizing an appropriation of ₱120,000 for the encouragement of local shipping lines.

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## MINES, MINERALS, THE METAL TRADE, MACHINERY, ETC.

MITSUI BUSSAN KAISHHA.—This company's activities in 1910 are represented by exportations to Far Eastern ports of 4,340,000 tons out of a total export from all mines in Japan of 9,400,000 tons during the year. The company supplied 48% of the coal imports at Hongkong, 45% at Singapore, 39% at Shanghai.

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SUNGEI RAIA TIN MINES.—The accounts for the half year show a profit of £4,573 and two interim dividends of 6d have been paid leaving a balance of £1,924 forward after providing £1,584 for depreciation. The company is negotiating for an additional area of 100 acres.

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THE GOPENG TIN MINES.—The Gopeng Tin Mining Co. Ltd. has declared its usual quarterly dividend of 18 pence and the New Gopeng Tin Mining Co. Ltd. a dividend of 15 pence a share.

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NEW TIN MINING CO.—The Tronoh South Ltd. has been organized in London with a capital of £100,000 to develop property a short distance from Tronoh station and covering an area of 230 acres.

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GOLD DREDGING RECORD—The Mining Journal directs attention to a record of efficiency in dredging in Australia. An Australian dredging record is stated to have been achieved by the No. 1 plant of the Tewksbury Proprietary Company, Braidwood, during the June half-year—400,500 cubic yards of ground being treated, at an average rate of 13 cubic yards per hour—the actual dredging cost being less than 1d. per cubic yard. The total costs (including management) averaged 1 08d. per cubic yard, while the ground was worth 2.19d per cubic yard. The profit for the term totalled £1,854. In all, 37 acres have been dredged during the sixteen months, while the total area to be worked by this plant is 685 acres.

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THE SHANTUNG MINING CO.—The balance sheet for the year 1910-11 shows a loss of marks 963.31. At the annual meeting the management was authorized to conclude an agreement with Peking with reference to rights to exploit iron mines in Shantung.

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RAUB AUSTRALIAN GOLD MINING CO. LTD.—The returns for the four weeks ended November 4, amounted to 775 ounces.

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AMERICAN MINING ENGINEERS VISIT JAPAN.—A party of members of the American Institute of Mining Engineers with their families, numbering 89 in all, spent three weeks in Japan last month. Dr. Joseph Struthers of New York, secretary of the Institute, was in charge. Among the prominent members of the party were Robert W. Hunt of Chicago, acting vice-president; Prof. J. W. Richards of S. Bethlehem, Pa., Vice-President; Mr. D. W. Brunton of Denver, ex-President; Mr. W. L. Saunders of New York, Vice-President; Dr. H. S. Drinker of S. Bethlehem, President of Lehigh University, and Dr. R W Raymond of Booklyn, Secretary of the Institute for twenty-fiveyears.

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OIL CONSUMPTION IN THE ORIENT—Conservative estimates place the total imports of 324,579,000 gallons an increase of about 20% during the year. Of this American imports amounted to 214,000,000 gallons.

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CHINESE ENGINEERING AND MINING CO. LTD.—The net profits for the year ended February 28, 1911, amounted to £152,219. The net profit after providing for all charges in China, £192,592; balance brought forward from last year £5,012 and gross receipts in London £579, total, £198,183. Deduct expenditure in Europe; salaries, stores, &c. £7,014; debentures, interest £25,700 debentures, redemption £10,000; directors' fees, £3,250; total £45,964; leaving a net balance of £152,219, which the directors recommend should be appropriated as follows:—In placing to reserve for depreciation (making a total reserve of £280,009) £35,000; in paying a final dividend of 1s. per share (free of tax) payable 2nd November 1911, £50,000; making a dividend of 10 per cent. for the year with the interim dividend of 1s. per share paid 1st May 1911, £50,000; directors' percentage of profits in accordance with the Article of Association, £1,220; income tax, £9,756 and carry forward £6,243

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THE PEKING SYNDICATE LTD.—The total output for October was 35,000 tons of coal and sales 41,000 tons.

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## FINANCIAL, COMMERCIAL AND MISCELLANEOUS

FOREIGN INTERESTS IN CHINA.—Consul General Anderson of Hongkong presents an interesting table comparing the foreign interest in China for the years 1906 and 1910. By firms and population the Japanese lead. In 1906 there were 739 Japanese firms and 15,548 persons and in 1910, 1,601 firms and 65,438 persons. Russians come next in increase in number of persons, viz 20 firms and 273 persons in 1906 and 298 firms and 49,395 persons in 1910. The British show a steady increase from 492 firms, 9,256 persons in 1906, to 601 firms, 10,140 persons in 1910.

The German increase is next in importance from 199 firms, 1,939 persons in 1906 to 238 firms, 4,106 persons in 1910.

American interests have fallen off from 112 firms 3.447 persons in 1906 to 100 firms and 3,176 persons in 1910.

The Portuguese increased from 51 firms, 3,184 persons in 1906 to 57 firms, 3,377 persons in 1910.

The French increased in number of firms but fell off in number of persons viz 94 firms, 2,189 persons, in 1906, and 110 firms, 1,925 persons, in 1910. The totals of all foreign firms and nationals in 1906 were 1,837 firms, 38 597 persons and in 1910 3,239 firms, 141,868 persons the, increase in number of persons being principally from Britain, Germany, Russia and Japan.

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THE BANK OF THE PHILIPPINES—The new charter of the Banco-Español Filipino changing the name to the Bank of the Philippines has been approved by the legislature to become effective January 1, 1912. At a meeting of the stockholders held early thismonth it was decided to increase the capital stock by ₱1,500,000 bringing it up to ₱4,500,000. The sale of this stock was authorized at ₱275, a premium of ₱75 a share, approximately the market value of the old stock.

Under the new charter the bank is authorized to act as a trust company, etc.

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PHILIPPINE U. S. TRADE.—The returns for the fiscal year 1911 place the volume at $36,632,705 as compared with $29,591,916 in 1910. Imports from the United States for 1911 amounted to $19 818,841 as against $10,798.678 in 1910 while the export show a falling off from $18,793,687 in 1910 to $16,813,864 in 1911.

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ILOILO BRANCH FOR CHARTERED BANK.—The Chartered Bank of India, Australia and China will inaugurate a branch in Iloilo January 1912.

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PHILIPPINE VEGETABLE OIL CO.—This company was incorporated early in the month with a capital of ₱350,000 for the purpose of installing and operating a cocoanut oil factory, and to carry on the manufacture of soap, etc. from the by-products. The incorporators are Archbishop J. J. Harty, P.C. Whitaker, Major T. L. Hartigan, Judge W. A. Kincaid, and President John S. Hord of the Banco Español Filipino.

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U S. Steel Products Co.
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**SANITARY ENGINEERING**
Gordon & Co.
Lambert-Springer Co.

**SAW MILLS**
Jardine, Matheson & Co.
Port Banga Lumber Co.

**SERUM**
Bureau of Science

**SHIP-CHANDLERY**
Ynchausti & Co.
Bazar Siglo XX.

**SHIPPING AGENTS**
CastlesBros.-Wolf & Sons
Cia. General de Tabacos
Shewan, Tomes & Co.
Stevenson & Co., Ltd.

**SHIPBUILDING AND REPAIRS**
El Varadero de Manila.
Fiat-san Giorgio Ltd.
Tsingtauer Werft
Hongkong & Whampoa Dock Co., Ltd.
The Kawasaki Dockyard Co. Ltd.
Kiangnan Dock and Engineering Co., Ltd.
Mitsu Bishi Dock and Engineering Works
New Engineering and Shipbuilding Works, Ltd.
Shanghai Dock and Engineering Co., Ltd.
The Taikoo Dockyard and Engineering Company of Hongkong, Limited
William Cramp & Sons.

**STEAMSHIP COMPANIES**
American Asiatic S. S. Co.
China and Manila S. S. Co., Ltd.
Cia. General de Tabacos
Nippon Yusen Kaisha
Occidental and Oriental S. S. Co.
Pacific Mail S. S. Co.
Transatlantica S. S. Co.
Ynchausti & Co.

**STEEL MANUFACTURERS**
United States Steel Products Export Co.

**STEEL WORKS**
Bohler Bros. & Co.
Riter-Conley Manf'g Co.
U. S. Steel Products Co.

**STOKERS**
Babcock & Wilcox Ltd.

**STRUCTURAL STEEL**
American Bridge Co.
Bohler Bros. & Co.
Riter-Conley Manf'g Co.
Shanghai Dock & Engineering Co. Ltd.
U. S Steel Products Co.

**SUGAR MACHINERY**
Honolulu Iron Works.

**SUPERHEATERS**
Babcock & Wilcox Ltd.

**TANKS**
Pacific Tank and Pipe Co.
Shanghai Dock & Engineering Co., Ltd.
U. S. Steel Products Co.

**TELEPHONES**
The Western Electric Co.
The Philippines Telegraph & Telephone Co.

**TILES AND BRICKS**
Green Island Cement Co., Ltd.
Chinese Eng. Mining Co.

**TOBACCO DEALERS**
British American Tobacco Co., Ltd.
Cia. General de Tabacos
Olsen & Co., Walter E.

**TOOLS**
American Tool Works Co.
Lodge & Shipley Machine Tool Co.
Shanghai Machine Co
Easterbrook Allcard & Co., Ltd.
The Selson Engineering Co. Ltd.
Shanghai Dock & Engineering Co. Ltd.

**WINDMILLS**
Fairbanks, Morse & Co.
Defiance Machine Works.

**WATER SOFTENERS**
Babcock & Wilcox Ltd.

**WATER, MINERAL**
Isuan

**WOOD WORKING MACHINERY**
American Tool Works Co.
Defiance Machine Works.
Lodge & Shipley Machine Tool Co.
Shanghai Dock & Engineering Co. Ltd.